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Description and analysis of the vascular flora of the Cataraqui Marsh area

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Description and analysis of the vascular flora of the Cataraqui Marsh area

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RÉSUMÉ

Une étude floristique a été réalisée pour aider Parcs Canada et d'autres organismes d'État dans l'aménagement du marais de Cataraqui, situé à la périphérie nord-est de Kingston, Ontario. L'information botanique a été recueillie en 13 excursions d'un jour chacune sur le terrain. On a récolté des plantes représentatives destinées à servir de matériel de recherche permanent. Les types de végétation observés à cet endroit comprennent six formes de boisés, deux de fourrés, au moins deux de milieux ouverts secs et huit de marais, plus trois catégories générales de végétation aquatique. Chaque type est décrit selon l'emplacement et la composition. Dans L'ensemble, les sites boisés plus secs sont à dominance de Chêne rouge, alors que l' Érable à sucre l'emporte sur les pentes plus humides des affleurements calcaires. Le marais compte essentiellement trois espèces de Quenouilles (Typha), bien que dans certaines parties d'autres espèces vasculaires soient en dominance. La végétation aquatique, typique des eaux alcalines de la région, offre des espèces comme l'Élodée, la Vallisnérie, le Myriophylle en épi, le Potamot pectiné et le Potamot crépu, la Cornifle nageante, l'Hétéranthère et le Nénuphar blanc.

Le texte est accompagné d'une liste annotée des plantes vasculaires, indiquant le type, l'habitat, l'origine (indigène ou introduite) et précisant si on possède ou non une récolté ou une photographie des plantes répertoriées. La liste compte 472 espèces indigènes et 153 introduites, soit un total de 625.

Bien qu le marais de Cataraqui contienne relativement peu d'espèces disjointes ou prés de la limite de leur aire normale de répartition, on y trouve des représentants de cinq groupes phytogéographiques intéressantes (méridional, occidental, appalachien, acidophile et calciphile). Le degré de diversité est extrêmement élevé à cause de la grande variété de substrats et d'expositions. Plus d'un tiers des plantes vasculaires trouvées dans la région centrale de Kingston (un territoire d'environ 1000 km^2) s'observent dans ce périmètre de moins de 10 km^2. On trouve plus d'espèces aquatiques différentes dans le marais que dans la plupart des autres marais du réseau des Grands Lacs.

Le marais de Cataraqui contient trois espèces vasculaires rares à l'échelle nationale, six rares et sept peu communes dans la province et 24 rares dans la région. Les espèces rares dans le pays et dans le province comprennent *Jeffersonia diphylla*, *Juncus secundus*, *Quercus muhlenbergii*, *Carex artitecta*, *Crataegus brainerdii* et *Cinna arundinacea*. Les espèces significatives sont largement dispersées dans le nord du territoire prospecté. Aucune communauté végétale ne présente d'importance particulière. Le marais et les habitats aquatiques offrent des potentialités très fortes comme aire de gagnage pour la sauvagine, du fait de la diversité, de L'abondance et de la disponibilité continue des plantes recherchées par les oiseaux aquatiques.

SUMMARY

A botanical inventory was conducted to assist Parks Canada and other government agencies in the planning and management of Cataraqui Marsh on the northeast side of Kingston, Ontario. Information on the vegetation was gathered during 13 day-long field trips. Representative plants were collected to provide a permanent record and material for research. Vegetation types present in the area include 6 types of woodland, 2 types of thickets, at least 2 types of dry open habitat, at least 8 categories of marsh vegetation and 3 general categories of aquatic vegetation. Each type is described with regard to location and composition. In general, the drier woodlands are dominated by Red Oak while Sugar Maple is dominant on the moister slopes of limestone outcrops. The marsh is comprised mainly of three species of Cattails, but parts of it are dominated by other species of vascular plants. The aquatic vegetation is of a type characteristic of alkaline nutrient-rich water in the region and includes such species as Waterweed, Tapegrass, European Water Milfoil, Sago Pondweed, Curly-leaved Pondweed, Coontail, Water Star Grass, and White Waterlily.

An annotated list of vascular plants found in the area is provided with notes on status and habitat, an indication of whether the plant is native or introduced, and whether or not there is a voucher specimen or photograph. This list includes 472 native and 153 introduced species; a total of 625.

Although the Cataraqui Marsh area contains relatively few species that are disjunct or near their distributional limits, it does include representatives of 5 interesting phytogeographic patterns (southern, western, Appalachian, granite rock, and limestone rock). Diversity is unusually high due to the variety of substrates and exposures. Over 1/3 of the vascular plants found in the central Kingston region (an area of approx. 1000 km^2 occur in this area of less than 10 km^2. There are more different kinds of aquatic plants in the area than in most other marshes in the Great Lakes system.

The Cataraqui Marsh area contains 3 nationally rare, 6 provincially rare, 7 provincially uncommon and 24 locally rare vascular plants. The provincially and nationally rare species include *Jeffersonia diphylla*, *Juncus secundus*, *Quercus muhlenbergii*, *Carex artitecta*, *Crataegus brainerdii* and *Cinna arundinacea*. The significant species are widely dispersed in the northern portion of the area. No plant communities are considered significant in terms of species associations. The marsh and aquatic habitats have an unusually high potential as a waterfowl feeding area because of the diversity, abundance, and continuous availability of preferred waterfowl foodplants.

INTRODUCTION

Cataraqui Marsh is situated on the northeast side of Kingston between 44°15'00" and 44°17'30" NL, and between 76°26'00" and 76 29'00" WL, in Frontenac County. It is part of the southern section of the Rideau Canal. Parks Canada, the Ontario Ministry of Natural Resources, and the Cataraqui Region Conservation Authority all have some level of responsibility for the management of the area.

The Cataraqui Marsh has been identified as one of the most important wildlife areas along the Rideau Canal system, (Lathem, 1976). Lists of vascular plants in various places in and around the marsh have been prepared by Beschel (1970), Garwood (see Lathem, 1977), Crowder (pers. comm., Fowler Herbarium, Queen's University), Hodges (1977) and Papilionis (1977). These lists have indicated high diversity and rare species but a detailed study of the vegetation of the marsh and its surroundings has never been conducted. Natural areas containing wetlands are assuming greater and greater significance, since wetland losses in southern Ontario, and particularly along the Lake Ontario shore, have been substantial (McCullough, 1981). The surviving wetlands contain a natural flora and fauna that has now been eliminated over extensive areas. Increasing numbers of migrating waterfowl and increasing recreational pressures, that were previously more widely dispersed, are now narrowly focussed on what is left. It is becoming ever more important to manage as effectively as possible those wetlands which can be protected. In order to improve their information base for planning and management, Parks Canada requested the help of the Biosystematics Research Institute of Agriculture Canada, in providing information on the occurrence of rare species and the types of vegetation present. Some of this information was presented in an unpublished report to Parks Canada (Catling, 1983), in a brief summary of botanical significance (Catling, 1985) and in a natural resource description with management considerations prepared by Blancher (1984). This publication represents a detailed presentation of the earlier work and includes the results of the 1984 field surveys as well as additional information provided by local naturalists.

Floristic information has application and interest beyond its direct use in planning and management. The Cataraqui Marsh area is one of the most floristically diverse sections of landscape traversed by highway 401 which crosses southern Ontario from east to west, and many naturalists have speculated about its biological significance. Students of Queen's University and members of the Kingston Field Naturalists' Club utilize the site for the study and enjoyment of plants and animals. Floristic information pertaining to this area is therefore of a more general interest as well.

Botanical inventories provide useful information on the composition of regional vegetation. Some inventories have furnished a basis for interesting comparisons. For example we know that the major aquatic weed in the navigation channel of the Cataraqui River has been in the Kingston region for less than 13 years since it was not recorded in a previous survey (Beschel et al., 1970). Botanical inventories help to document the spread of introduced weeds as well as changes in the status of native species. The biologist is also provided with an indication of where certain plants may be found and studied.

Thus, this floristic study was undertaken with the hope that the results would satisfy the immediate needs, and also provide information that would be of long term use to naturalists and biologists.

THE STUDY AREA

The study area is approximately 8 km^2 in extent. It includes all of the open water and adjacent marshes and slopes of the lower Cataraqui River. At least 80% of the study area is marsh and aquatic habitat. Major features of the study area are illustrated in Figures 1 and 2.

The upper portion of the river (below Kingston Mills and above Highway 401) has a high granite ridge rising approximately 30 m above the river on either side. The well-drained substrates on these ridges have an acid reaction, in direct contrast to the substrates over much of the rest of the area which are alkaline.

Low escarpments of Black River limestone extend along either side of the lower marsh forming steep slopes to 25 m above the marsh. There are a few scarps to 5 m high, but most of the limestone is overlain by a stony calcareous glacial till. In lower areas this is mixed with clay giving rise to poorly drained alkaline soils (Lansdowne clay and Napanee clay) which are most prevalent at the north end (Gillespie, Wicklund and Matthews, 1966). Where the parent material is coarser and well-drained, an acid surface reaction develops as on some of the higher islands and promontories.

A long history of European settlement has also had an influence on the vegetation of the area. Within a mile to the south is the site of Fort Frontenac, established in 1673. It is one of the earliest permanent establishments in eastern Ontario. The more widespread settlement of Frontenac County began in 1783. The Rideau Canal was constructed following the war of 1812-14 to provide a military supply route. The long history of human pressure on the landscape has probably been most felt as the south end. Clearing and farming have resulted in new habitats which are largely colonized by plants introduced from Europe.

Although there has been little detailed inventory work done in the Cataraqui area, it has not gone totally unnoticed. A resource management study for the area (Lathem, 1976) stresses biological values, makes recommendations regarding zoning changes and discusses existing and potential recreational uses. The area is not considered regionally significant from a biological viewpoint by the Ontario Ministry of Natural Resources (M.N.R., pers. comm.). It should be noted however, that the M.N.R. system of significant biological areas stresses the occurrence of significant species rather than concepts of diversity and wildlife value which would rate unusually high for the Cataraqui Marsh area. The gorge at the north end of the area is considered to be a class 1 earth science feature by M.N.R.

METHODS

During the summers of 1982, 1983 and 1984 a total of 13 day-long survey trips were made to the area (with 5 hours of field survey per trip). The surveys covered various times of the year from early spring to late fall so as to locate all species present in identifiable condition. The aquatic plant surveys were conducted in late summer and fall.

Dominant vegetation cover in various sections was recorded in a field notebook. In addition representative plants, collected as vouchers for the study, were deposited in the vascular plant herbarium of Agriculture Canada (DAO). Rare species were collected only in so far as was necessary to confirm and verify their identity. Photographs were taken to supplement the limited material of rare species collected.

These procedures enabled the preparation of an annotated checklist of vascular plants and a general description of vegetation. The results of the study were evaluated in terms of phytogeography, diversity, significant species, and significance to waterfowl and other wildlife, through reference to the literature. With regard to significant species, the central Kingston region (see Beschel et al., 1970 p.V) was selected as the regional area. Taxa known from only one or two localities in this region (according to Beschel et al., 1970, and a 1983 survey of specimens in the Queens University herbarium) are considered to be locally rare. Provincial and National rarity is based on Argus and White (1977). "Provincially uncommon" is based on information gathered from herbarium collections (CAN, DAO, QK).

RESULTS AND DISCUSSION
1. VEGETATION

A. Wooded Areas

A.1. Red Oak (*Quercus borealis*) dominated with some combination of *Quercus alba*, *Quercus macrocarpa*, *Fraxinus americana*, *Prunus serotina*, *Pinus strobus* and *Populus* spp.

A.1.1. Red Oak on Bells Island

The wooded areas on Bells Island are dominated by Red Oak with scattered Shagbark Hickory (*Carya ovata*) and Burr Oak (*Quercus macrocarpa*). In lower areas and along the shores are Black Willow (*Salix nigra*) and White Ash (*Fraxinus americana*). An understory of shrubs and vines is well developed in some places, including *Amelanchier sanguinea* var. *sanguinea*, *Prunus virginiana*, *Prunus interstitia*, *Rhamnus cathartica*, *Viburnum lentago* and *Vitis riparia*. Common herbs include *Carex pensylvanica*, *Poa compressa*, *Fragaria virginiana*, *Luzula multiflora*, *Podophyllum peltatum*, *Thalictrum dioicum*, *Viola septentrionalis*, *Solidago juncea* and *Waldsteinia fragarioides*. In part of the woods that have been used as a picnic playground, excessive trampling has promoted such species as *Poa pratensis*, *Poa annua*, *Poa compressa*, *Agrostis stolonifera*, *Taraxacum officinale* and *Festuca rubra*.

A.1.2 Red Oak on Granite Outcrops below Kingston Mills.

The granite outcrops have a forest dominated by Red Oak with lesser amounts of White Ash (*Fraxinus americana*) and White Pine (*Pinus strobus*). In addition there are scattered White Oak (*Quercus alba*), Shagbark Hickory (*Carya ovata*), Black Cherry (*Prunus serotina*), Red Maple (*Acer rubrum*), Ironwood (*Ostrya virginiana*), Blue Beech (*Carpinus caroliniana*), Paper Birch (*Betula papyrifera*), Poplars (*Populus* spp.) and Red Cedar (*Juniperus virginiana*). In the lower areas and valleys of these outcrops, Sugar Maple (*Acer saccharum*), Basswood (*Tilia americana*) and Hemlock (*Tsuga canadensis*) are characteristic of valley bottoms and the steep NW-facing slope along the river below Kingston Mills is dominated by Eastern White Cedar (see A.4).

The east-facing and north-facing slopes have luxurient growths of Marginal Shield Fern (*Dryopteris marginalis*) and Rock Polypody (*Polypodium virginianum*), with *Geranium robertianum*, *Solidago caesia*, and *Taxus canadensis*.

The sites that are more exposed to the sun and consequently drier, are always dominated by Red Oak. This applies to the entire SE-facing outcrop forming the west shore of the upper Cataraqui River. The herb layer includes *Agrostis perennans*, *Carex pensylvanica*, *Hystrix patula*, *Panicum xanthophysum*, *Prenanthes alba*, *Solidago caesia*, *Waldsteinia fragarioides*, *Aster macrophyllus* and *Veronica officinalis*.

The tops and to a lesser extent the slopes of the granite outcrops are often only partially wooded with open shrubby clearings and exposed rock surfaces. Common shrubs include *Juniperus communis*, *Rubus flagellaris*, *Vaccinium angustifolium*, *Viburnum rafinesquianum*, *Rhus typhina*, *Diervilla lonicera*, *Cornus obliqua*, *Amelanchier arborea* spp. *arborea* and *Amelanchier alnifolia* var. *compacta*. Varius grasses (*Danthonia spicata*,

Poa compressa, *Agrostis hyemalis*, *Deschampsia flexuosa*, *Panicum depauperatum* var. *involutum*, *Panicum implicatum* and *Panicum tuckermanii*) dominate the open areas of shallow soil with *Rumex acetosella*, *Saxifraga virginiensis*, *Corydalis sempervirens*, *Solidago juncea*, *Solidago hispida*, *Selaginella rupestris*, *Aquilegia canadensis*, *Polygonum convolvulus*, *Fragaria virginiana*, *Commandra umbellata*, and *Woodsia ilvensis* also being important. *Helianthus divaricatus*, *Trifolium aureum*, *Polygonum douglasii*, *Aralia hispida*, *Arctostaphylos uva-ursi*, and *Juncus secundus* occur locally in open areas on the west ridge. At the southern end of the west ridge and in a few other places several introduced weedy species are common in the open dry clearings including *Agropyron repens*, *Ambrosia artemisiifolia*, *Phleum pratense* and *Hypericum perforatum*.

A.1.3. North Woods & North West Woods

This woodland is dominated by Red Oak, White Oak (*Quercus alba*) and White Ash (*Fraxinus americana*) with an understory of *Carpinus caroliniana*, *Cornus obliqua*, *Prunus virginiana*, *Rubus odoratus*, *Viburnum lentago* and *Viburnum rafinesquianum*. The section north of Hwy. 401 is more complex. White Oak is somewhat less important here and Black Cherry (*Prunus serotina*) is more important, with lesser amounts of Bitternut Hickory (*Carya cordiformis*) and Shagbark Hickory (*Carya ovata*), Paper Birch (*Betula papyrifera*), Large-tooth Aspen (*Populus grandidentata*), Trembling Aspen (*Populus tremuloides*) and Beech (*Fagus grandifolia*). Frequent herbs throughout the area include *Trillium grandiflorum*, *Erythronium americanum*, *Waldsteinia fragarioides*, *Solidago flexicaulis*, *Uvularia sessilifolia*, *Carex pedunculata*, *Podophyllum peltatum* and *Thalictrum dioicum*. The lower depressions have a few Red Maples (*Acer rubrum*) and Silver Maples (*Acer saccharinum*) and Winterberry shrubs (*Ilex verticillata*). *Impatiens biflora* and *Polygonum punctatum* are prevalent in these lower depressions.

A.1.4. Red Oak dominated section of west limestone outcrop.

A limited section of the outcrop is Oak-dominated with Sugar Maple dominating the slopes on either side (A.2.2.). Burr Oak (*Quercus macrocarpa*) and Ironwood (*Ostrya virginiana*) are also important with lesser amounts of Chestnut Oak (*Quercus muhlenbergii*), White Oak (*Quercus alba*) and Red Elm (*Ulmus rubra*). The understory includes *Diervilla lonicera*, *Prunus virginiana*, *Poa compressa*, *Viburnum rafinesquianum*, *Carex pensylvanica*, *Solidago juncea*, *Helianthus divaricatus*, *Solidago flexicaulis*, and *Thalictrum dioicum*.

A.1.5. Islands in the marsh and tips of promontories (see Fig. 3).

The forests are dominated by Red Oak with Burr Oak (*Quercus macrocarpa*) and White Oak (*Quercus alba*). The characteristic shrubs in the understory are *Cornus obliqua*, *Cornus racemosa*, *Viburnum rafinesquianum* and *Viburnum lentago*. Other shrubs such as *Vaccinium angustifolium*, *Rhamnus catharticus*, *Lonicera dioica*, *Sambucus canadensis*, *Sambucus pubens* and *Ceanothus americanus* are present on some islands and promontories.

The herb layer is well developed and includes *Agrostis hyemalis*, *Agropyron repens*, *Poa compressa*, *Poa pratensis*, *Festuca rubra*, *Danthonia spicata*, *Carex umbellata*, *Moehringia lateriflora*, *Waldsteinia fragarioides*, *Maianthemum canadense* var. *interius*, *Hypericum punctatum*, *Scophularia lanceolata*, *Anemone quinquefolia*, *Solidago juncea* and *Solidago nemoralis*.

Some parts of islands and promontories are so low as to have only *Calamagrostis canadensis*. Island no. 2 has the only shrubs of *Ceanothus americanus* found in the area, and the most extensive stand of *Carex foenea*. The herbaceous flora of island no. 16 is particulary diverse, with *Deschampsia flexuosa*, *Sisyrinchium montanum*, *Trifolium aureum*, *Carex artitecta*, *Luzula multiflora*, *Panicum linearifolium* var. *linearifolium* and *Trisetum triflorum* ssp. *molle* in addition to many of the characteristic species listed above.

A.2. Sugar Maple (*Acer saccharum*) woodlands.

A.2.1. The East Limestone outcrop

Much of the eastern limestone slope has been extensively cut. In many places the woodland is comprised of older essentially open-grown trees with horizontally spreading lower branches accompanied by a relatively dense growth of younger trees and saplings. In the northern section, the woodland is in a more natural state. The most frequent trees include Sugar Maple (*Acer saccharum*), Red Oak (*Quercus rubra*), Shagbark Hickory (*Carya ovata*), White Ash (*Fraxinus americana*), American Elm (*Ulmus americana*) and Basswood (*Tilia americana*). White Pine (*Pinus strobus*), White Oak (*Quercus alba*), Yellow Birch (*Betula lutea*), Blue Beech (*Carpinus caroliniana*) and Ironwood (*Ostrya virginiana*) are also present with some Black Willow (*Salix nigra*) along the marsh edges. The sporadic shrub layer is composed of *Rhamnus cathartica*, *Sambucus pubens*, *Cornus alternifolia*, *Staphylea trifoliata*, *Ribes americanum*, and *Cornus stolonifera*. In some more open areas, *Vitis riparia*, *Solanum dulcamara* and *Rubus strigosus* are common. Characteristic herbs on middle and lower slopes include *Actaea rubra*, *Arisaema triphyllum*, *Asarum canadense*, *Alliaria petiolata*, *Caulophyllum thalictroides*, *Claytonia caroliniana*, *Circaea quadrisulcata*, *Erythronium americanum*, *Lapsana communis*, *Ranunculus abortivus*, *Trillium erectum*, and *Carex cephalophora*. The upper slopes have a sparse herb layer but Sugar Maple seedlings and *Podophyllum peltatum* are locally common.

A rocky talus area near the Fingers has *Acer spicatum*, *Impatiens pallida*, *Cystopteris bulbifera*, *Dryopteris marginalis*, *Dryopteris goldiana* and *Geranium robertianum*.

A.2.2. West limestone outcrop.

The west limestone outcrop is similar to the east limestone outcrop, but is somewhat drier and a part of it is dominated by oak (A.1.4). To the north and south of the oak area, the woodland is dominated by Sugar Maple, Red Oak (*Quercus borealis*), White Ash (*Fraxinus americana*) and Basswood (*Tilia americana*) with Black Cherry (*Prunus serotina*) becoming more important at the south end where the forest has been severely cut. Shagbark Hickory (*Carya ovata*), Red Elm (*Ulmus rubra*), Ironwood (*Ostrya virginiana*) and Beech (*Fagus grandifolia*) are also present. Since the slope is relatively

dry and steep, the ground cover is sparse. Characteristic species include *Asarum canadense*, *Solidago flexicaulis* and *Thalictrum dioicum* with lesser amounts of *Geranium maculatum*, *Geranium robertianum*, *Ranunculus abortivus* and *Trillium grandiflorum*. Where the slope is more open, *Diervilla lonicera*, *Viburnum rafinesquianum*, *Prunus virginiana*, *Cornus racemosa*, *Poa compressa*, *Carex pensylvanica* and *Helianthus divaricatus* are prominent.

A.3. Eastern Hemlock (*Tsuga canadensis*), White Pine (*Pinus strobus*).

The open Red Oak vegetation types characteristic of the islands and tips of promontories grades into this conifer dominated woodland at the base of promontories (The Fingers). There are numerous weak springs in this area, or at least surfacing of ground water, at the base of Hemlock-dominated slopes with little herbaceous ground cover. Herbs include *Maianthemum canadense*, *Solidago caesia*, *Carex pedunculata* and *Poa compressa*. At bases of slopes in wet seepy areas, *Impatiens biflora*, *Onoclea sensibilis*, *Carex retrorsa* and *Glyceria* spp. are prevalent.

A.4. White Cedar (*Thuja occidentalis*) Slope

Along the east granite outcrop beside the river, the steep NW-facing granite slopes are covered with White Cedar and extensive growth of ferns (*Dryopteris marginalis*, *Polypodium virginianum*). This is a very narrow zone within A.1.2.

A.5. Disturbed second growth woods

These areas are identified on the basis of a substantial component of introduced trees and shrubs. The slope south of Barkers Point provides a good example. The abundance of Manitoba Maple (*Acer negundo*) near the quarry represents a similar situation in an earlier stage of development. South of Barkers Point there are extensive thickets of escaped Lilac (*Syringa vulgaris*) along with *Rhamnus catharticus*, *Ribes sativum*, *Acer negundo* and *Lonicera tatarica* and old apple trees (*Pyrus malus*). Native trees and shrubs are also present including Shagbark Hickory (*Carya ovata*), Sugar Maple (*Acer saccharum*) Black Cherry (*Prunus serotina*), Choke Cherry (*Prunus virginiana*), Wild Raspberry (*Rubus strigosus*), Blackberry (*Rubus allegheniensis*), and Staghorn Sumac (*Rhus typhina*). Herbaceous species include *Solidago canadensis*, *Fragaria virginiana*, *Geum canadense*, *Ranunculus acris*, *Alliaria petiolata*, *Hesperis matronalis*, *Campanula rapunculoides*, *Prunella vulgaris* and *Arctium minus*. Various cultivated plants persisting or spreading around old foundations suggest earlier habitation. The persisting or spreading cultivated species include *Ribes sativum*, *Convallaria majalis*, *Ornithogallum umbellatum*, *Crocus sativus*, *Malus sylvestris*, *Ligustrum vulgare* and *Valeriana officinalis*. The reports of *Trillium viride* and *Mertensia virginica* both found in the Point area by A.E. Garwood (Lathem, 1976) were probably also persisting from cultivation.

A.6. Pine Plantation

This area has a dense stand of planted Scots Pine (*Pinus sylvestris*) and Norway Spruce (*Picea abies*). There is no substantial shrub or herb layer.

B. Thickets

B1. Speckled Alder (*Alnus rugosa*)

In addition to Speckled Alder, Winterberry (*Ilex verticillata*) and Chokeberry (*Aronia prunifolia*) may be present. Characteristic herbs in more open portions of the thickets include *Onoclea sensibilis*, *Glyceria* spp., *Thelypteris palustris*, *Alisma plantago-aquatica*, *Leersia oryzoides*, *Muhlenbergia mexicana*, *Carex comosa*, *Carex tenera*, *Eleocharis elliptica*, *Calla palustris*, *Solanum dulcamara*, *Polygonum* spp., *Caltha palustris*, *Nasturtium officinale*, *Veronica anagallis-aquatica*, *Lythrum salicaria*, and *Cicuta bulbifera*. *Thelypteris palustris*, *Bidens cernua*, *Biden frondosa* and *Sagittaria cuneata* are abundant on the muddy flats in late summer. The alder thickets occur around springs at the edge of the marsh. Alder thickets in a boggy pocket near the Fingers had sphagnum hummocks with *Osmunda cinnamomea*, *Osmunda regalis* and *Carex leptalea*. *Thelypteris palustris*, *Bidens cernua*, *Bidens frondosa* and *Saggittaria cuneata* are abundant on the muddy flats.

B.2. Hawthorn (*Crataegus* spp.)

The dominants are various species of Hawthorns (*Crataegus macrantha*, *C. chrysocarpa*, *C. punctata*, and *C. submollis*) occasionally with other shrubs (*Cornus racemosa*, *Zanthoxylum americanum*, *Viburnum lentago*, and *Cornus obliqua*). Ground cover beneath the shrub cover is limited by both shade and rate of colonization of shade tolerant species. Common herbs beneath and around the shrubs include *Poa compressa*, *Fragaria virginiana*, *Prunella vulgaris*, *Ranunculus acris*, *Poa pratensis*, *Agrostis stolonifera*, *Festuca rubra*, *Geum canadense*, *Solidago canadense* and *Agrimonia gryposepala*.

C. Open Herbaceous vegetation on dry and mesic sites

C.1. Pasture and Meadow

These areas are dominated by grasses including *Poa pratensis*, *Poa compressa*, *Agropyron repens*, *Agrostis stolonifera*, *Dactylis glomerata*, *Phleum pratense* and *Festuca rubra*. Other characteristic species include *Medicago lupulina*, *Trifolium repens*, *Trifolium pratense*, *Daucus carota*, *Plantago lanceolata* and *Prunella vulgaris*.

The pasture land north of Barkers Point (C.1.3) has large open-grown trees of Shagbark Hickory (*Carya ovata*), Black Maple (*Acer nigrum*), American Elms (*Ulmus americana*), White Oak (*Quercus alba*) and Burr Oak (*Quercus macrocarpa*). Common shrubs include *Rosa multiflora*, *Berberis vulgaris* and *Juniperus communis*. An introduced sedge, *Carex spicata*, is particularly common in this pasture area.

The pasture area at the north end (C.1.4) has developing Hawthorn thickets (B.2.) and scattered wet hollows with sedges, rushes, and spikerushes (*Carex* spp., *Juncus* spp., *Eleocharis* spp.).

C.2. Open disturbed ground

These habitats occur in situations where the native vegetation has been destroyed, severely altered, or where new habitat for colonization has been created (e.g. around buildings, along roadways and railways, industrial sites, fill, dredge spoil, etc.). In some of these situations the disturbance (trampling, cutting, use of herbicides, etc.) is continuous. Two extensive disturbed areas occur in the study area, and many plants characteristic of these areas were not encountered elsewhere.

In the railway gravel *Diplotaxis tenuifolia*, *Salsola kali* var. *tenuifolia*, *Corydalis aurea*, *Setaria viridis* and *Equisetum arvense* are frequent. On the railway banks a variety of plants occur including *Agropyron repens*, *Bromus* spp., *Rubus strigosus*, *Rhus radicans* var. *rydbergii*, *Arctium minus*, *Sanguinaria canadensis*, *Lithospermum officinale*, *Fragaria virginiana*, *Celastrus scandens*, *Oenothera biennis*, *Saponaria officinalis*, *Dactylis glomerata*, *Lolium perenne* and *Asclepias syriaca*.

The gravelly open limestone around and below the quarry has the following species: *Phleum pratense*, *Poa compressa*, *Agrostis stolonifera*, *Agropyron repens*, *Solidago nemoralis*, *Chrysanthemum leucanthemum*, *Melilotus alba*, *Echium vulgare*, *Cichorium intybus*, *Solidago juncea*, *Arctium minus*, *Cirsium vulgare*, *Centaurea* spp., *Solidago canadensis*, *Daucus carota*, *Trifolium* spp., *Lotus corniculatus*, and *Ambrosia artimesiifolia*. Frequent woody species here include *Acer negundo*, *Rhus typhina*, and *Rubus strigosus*.

C.3. Open granite bald

The characteristic vegetation of such sites is treated as clearings in Oak woodland and is described under A.1.1.

D. Marsh Vegetation

The marsh vegetation is complex. It is certainly not a monospecific stand of Cattails (see under "Diversity"), but the relative areas of different kinds of marsh vegetation are difficult to assess and the recognizable types of vegetation themselves intergrade making the limits somewhat arbitrary. Aerial photographs show vegetation patterns but these do not always correspond to major vegetation types. This impression of complexity and variability in the Cattail Marsh, based on aerial photography, is confirmed upon exploring it. Possibly as much as 30% of the marsh area is sedge and graminoid marsh with the remainder being some type of Cattail Marsh.

A variable zonation of marsh vegetation is apparent in transects from the edge toward the river. Bluejoint, Reed Canary Grass-Sedge meadows (D.1.1., D.1.2.) occur on the higher edges and on high places within the marsh. The Spike Rush marsh (D.1.3.) occurs in periodically deeply flooded depressions within this zone. Wide-leaved Cattail (*T. latifolia*) occurs in deeper and wetter portions of the marsh whereas the interior and drier portions have narrow-leaved cattail (*T. angustifolia*). The border of the marsh adjacent to the channels and river have hybrid Cattail (*T.* X *glauca*). Within the

Cattail marsh are floating sedge mats (D.1.5.) and stands of Giant Reed (D.1.6.). The deep sedge marsh (D.1.4.) vegetation occurs along shores and edges of Cattail marsh.

D.1. Sedge and graminoid marsh

D.1.1. and 2. Blue joint (*Calamagrostis canadensis*) and Sedges (*Carex* spp.)

This type of vegetation is characteristic of the higher edges of cattail marshes (D.2.). Bluejoint varies from almost total dominance (D.1.1.), to low importance with the sedges being dominant (D.1.2.). The dominant sedges include *Carex stricta*, *Carex aquatilis* and *Carex lacustris*. Where the sedges are dominant the plant community is more diverse. Other important species include *Carex lanuginosa*, *Carex atherodes*, *Thelypteris palustris*, *Potentilla palustris*, *Campanula aparinoides*, *Eupatorium perfoliatum*, *Eupatorium maculatum*, *Lathyrus palustris*, *Teucrium canadense*, *Convolvulus sepium*, *Scutellaria galericulata*, *Asclepias incarnata*, *Mentha arvensis*, *Solidago graminifolia*, *Phalaris arundinacea*, *Stachys tenuifolia* and *Verbena hastata*.

D.1.3. Spike Rush (*Eleocharis smallii*) Marsh.

These areas are dominated by *Eleocharis smallii* with *Carex aquatilis*, *Scirpus cyperinus*, *Calamagrostis canadensis*, *Sparganium eurycarpum* and *Carex crinita*.

D.1.4. Deep Sedge Marsh

In some places along the shore, there are rich stands of emergent vegetation including *Scirpus fluviatilis*, *Eleocharis smallii*, *Butomus umbellatus*, *Scirpus validus*, *Sparganium eurycarpum*, *Phalaris arundinacea*, *Typha latifolia*, *Typha* X *glauca*, *Hydrocharis morsus-ranae*, *Sagittaria latifolia* and submersed *Lemna trisulca*.

D.1.5 Floating Sedge Mat

Floating mats of various size are scattered throughout the Cattail marsh. The most important species on many of these floating mats is *Carex lasiocarpa*. Other important species are *Carex lacustris*, *Carex prairea* or *diandra*, *Typha latifolia*, *Calamagrostis canadensis*, *Acorus calamus*, and *Potentilla palustris*.

D.2. Cattail (*Typha*) Marsh

The species that occur with *T.* X *glauca*, in the northwest corner of the marsh and along the edges of the channels are *Phalaris arundinacea*, *Bidens cernua*, *Bidens frondosa*, *Cicuta bulbifera*, *Veronica anagallis-aquatica*, *Lythrum salicaria*, *Lemna* spp. and *Wolffia* spp. With *T. angustifolia* in the central portions of the marsh are *Naumbergia*

thyrsiflora, *Potentilla palustris* and *Potamogeton gramineus*. The wide-leaved Cattail, (*T. latifolia*) occurs with many marsh species including *Sium suave*, *Lythrum salicaria*, *Lycopus* spp., *Galium* spp., and *Impatiens biflora*, and often with the other Cattails.

E. Aquatic Vegetation

Along the main channel of the Cataraqui River there is considerable water movement due to both periodic high water and the Rideau Canal boat traffic. The narrower section (above the highway 401 bridge) has the most rapid current. Characteristic aquatics in this section include *Myriophyllum spicatum*, *Vallisneria americana*, *Najas flexilis*, *Potamogeton nodosus* and in water over 1 m deep, *Najas guadalupensis*. The lower section of the main channel (below the highway 401 bridge) is dominated by *Vallisneria americana* with some *Potamogeton crispus* and *Potamogeton pectinatus* and lesser amounts of *P. richardsonii* and *Myriophyllum spicatum*.

The water of the main channel is frequently cloudy either due to disturbance of the substrate or to algal blooms originating in Colonel By lake and other lakes in Rideau system upstream. The cloudiness in the main channel is in sharp contrast to clear water in the two streams in the marsh entering the main channel from the west. Undoubtedly there are differences in water chemistry and substrate that are associated with the differences in clarity, and it is not surprising that there are differences in the vegetation. The marsh channels are without *Vallisneria americana* and *Myriophyllum spicatum* but instead have dense growth of *Najas flexilis*, *Heteranthera dubia*, *Ceratophyllum demersum*, *Utricularia vulgaris* and *Nymphaea tuberosa*. *Potamogeton pectinatus*, *Potamogeton crispus*, *Elodea canadensis*, *Nuphar variegatum* and *Myriophyllum exalbsecens* are also quite common. Both of the marsh channels have large stands of Wild Rice *Zizania palustris* var. *palustris*.

Several species were found only along the borders of the main channel water and the marsh channel water. Included in this category are *Bidens beckii*, *Potamogeton natans*, and *Potamogeton epihydrus* var. *ramosus*.

The large section of open water north of Bells Island on either side of the main channel is dominated by *Elodea canadensis*, *Potamogeton crispus*, *Ceratophyllum demersum* and *Heteranthera dubia*. *Potamogeton crispus* and *Myriophyllum spicatum* dominate much of the area early in the season, but they begin to die back in mid-June. By late summer, the other species appear to be the most important. *Vallisneria americana*, *Nymphaea tuberosa*, *Lemna trisulca* and *Myriophyllum spicatum* are locally important.

2. ANNOTATED LIST OF VASCULAR PLANTS OF THE CATARAQUI MARSH STUDY AREA

In the following list, species are organized in the usual phytogenetic sequence of families following Gleason and Cronquist (1963), but within the families, the genera and within them, the species, are arranged alphabetically. An indication of status is given by "rare" (1-2 stations), "occasional" (3-6 stations), and "common" (over 6 stations) where stations are defined as locations of occurrence more than 100 m apart. In addition, the general habitat and location in the study area is provided. Introduced (i.e. non-native) species are indicated with "I" before the name. Species for which collections were made (totalling 295 species and 352 collections) are indicated with an asterisk(*).

LYCOPODIACEAE

Lycopodium digitatum A.Braun (*L. complanatum* var. *flabelliforme*)
Rare, west granite outcrop.

Lycopodium lucidulum Michx.
Rare, east granite outcrop.

Lycopodium dendroideum Michx. (*L. obscurum*)
Rare, west granite outcrop.

SELAGINELLACEAE

* *Selaginella rupestris* (L.) Spreng.
Rare, open granite outcrop on west side of upper Cataraqui River.

EQUISETACEAE

Equisetum arvense L.
Common, disturbed open ground

Equisetum hyemale L.
Rare, along the railway.

* *Equisetum palustre* L.
Occasional, along the east shore

Equisetum variegatum Schleich.
Rare, wet meadow below the quarry.

OPHIOGLOSSACEAE

Botrychium matricariaefolium A.Br.
Rare, deciduous woods on east side.

Botrychium virginianum (L.) Sw.
Rare, deciduous wood at north end.

OSMUNDACEAE

Osmunda cinnamomea L.
Rare, boggy lowland near the Fingers.

Osmunda claytoniana L.
Rare, wooded edge of lowland near the Fingers.

Osmunda regalis L. var. *spectabilis* (Willd.) Gray
Rare, boggy lowland near the Fingers.

ASPIDIACEAE

Adiantum pedatum L.
Rare, deciduous woods on east side.

* *Athrium felix-femina* (L.) Roth
Common, woodlands throughout.

* *Athyrium thelypteroides* (Michx.) Desv.
Rare, base of wooded limestone talus near the Fingers.

Cystopteris bulbifera (L.) Bernh.
Rare, wooded limestone talus near the Fingers.

Cystopteris fragilis (L.) Bernh.
Common, moist places on rocky outcrops.

Dryopteris carthusiana (Vill.) H.P. Fuchs (*D. spinulosa*)
Rare, rocky woods near the Fingers.

Dryopteris cristata (L.) Gray
Rare, swampy woods near the Fingers and moist rocky faces on west granite outcrop.

* *Dryopteris goldiana* (Hook.) Gray
Rare, rocky wooded limestone talus on east side.

Dryopteris intermedia Muhl.
Rare, rocky woods near the Fingers.

* *Dryopteris marginalis* (L.) Gray
Common, rocky woods.

* *Dryopteris X triploidea* Wherry
Rare, north-facing slope at north end of east granite outcrop.

Gynocarpium dryopteris (L.) Newm.
Rare, woods at north end.

Matteuccia struthiopteris (L.) Todaro
Rare, moist seepy areas along slope on east side.

Onoclea sensiblis L.
Common, marsh and wet woods.

* *Polypodium virginianum* L.
Common, granite rock outcrops at north end.

Polystichum acrostichoides (Michx.) Schott.
Occasional, deciduous woods.

Pteridium aquilinum (L.) Kuhn
Occasional, dry semi-wooded slopes and islands in the marsh.

* *Thelypteris palustris* Schott.
Common, open marsh and swampy woods.

* *Woodsia ilvensis* (L.) R.Br.
Common, granite outcrops at north end.

TAXACEAE

* *Taxus canadensis* Marsh.
Common, wooded granite outcrops at north end.

PINACEAE

Abies balsamea (L.) Mill.
Rare, low place on east granite outcrop.

Larix laricina (Du Roi) K. Koch.
Rare, boggy lowland near the Fingers.

Picea glauca (Moench) Voss
Rare, granite outcrop at north end.

Pinus resinosa Ait.
Rare, granite outcrop at north end.

Pinus strobus L.
Common, mostly on the east side.

I *Pinus sylvestris* L.
Rare, south side of pasture at north end.

Tsuga canadensis (L.) Carr.
Common, mostly on the granite outcrops at the north end.

CUPRESSACEAE

* *Juniperus communis* L.
Occasional, especially on granite outcrops at north end.

Juniperus virginiana L.
Occasional, outcrops, fields and islands in the marsh.

TYPHACEAE

* *Typha angustifolia* L.
Common, central portions of main marsh and marsh edges.

* *Typha X glauca* Godr.
Common, edges of channels and river and north west corner of main marsh.

* *Typha latifolia* L.
Common, central portions of the main marsh and marsh edges.

SPARGANIACEAE

Sparganium chlorocarpum Rydb.
Rare, edge of main channel above hwy. 401.

* *Sparganium eurycarpum* Engelm.
Occasional, edges of main river channel.

NAJADACEAE

* *Najas flexilis* (Willd.) Rostk.
Common throughout in water to 2 m deep.

* *Najas guadalupensis* (Spreng.) Magnus
Common, especially in upper portions of Cataraqui River.

Zannichellia palustris L.
Rare, washed ashore at Bells Island.

Potamogeton amplifolius Tuckerm.
Occasional, in water to 2 m deep, south bay north of Bells Island.

*I *Potamogeton crispus* L.
Common in lower end of Cataraqui River.

* *Potamogeton epihydrus* Raf. var. *ramosus* (Peck) House
Occasional, in the upper fast portion of the Cataraqui River and edge of lower marsh.

* *Potamogeton filiformis* Pers. var. *alpinus* (Blytt) Aschers & Graebner
Rare, only in channel or east side of upper marsh.

* *Potamogeton gramineus* L.
Occasional, in shallow water in main Cattail marsh.

* *Potamogeton natans* L.
Occasional, protected bays in main marsh.

* *Potamogeton nodosus* Poir.
Rare, only in the upper fast portion of the Cataraqui River.

* *Potamogeton pectinatus* L.
Common, in water to 2 m deep.

* *Potamogeton perfoliatus* L.
Occasional, east wide of marsh & near Bells Island.

* *Potamogeton pusillus* L. var. *pusillus*
Common, especially in marsh channels.

* *Potamogeton pusillus* L. var. *tenuissimus* Mert. & Koch.
Common, mostly in the main marsh area.

* *Potamogeton richardsonii* (Benn.)Rydb.
Common, in water to 2 m deep.

* *Potamogeton zosteriformis* Fern.
Occasional, around the main marsh and in the marsh channels.

ALISMATACEAE

* *Alisma gramineum* Lej.
Rare, limestone pavements along lower east shore in water to 1/2 m deep.

* *Alisma plantago-aquatica* L. (*sensu lato*)
Common, in water and wet open places.

* *Sagittaria cuneata* Sheldon
Occasional, on mud flats around marsh and in isolated pools near the fingers.

Sagittaria latifolia Willd.
Common, cattail marsh.

* *Sagittaria rigida* Pursh.
Occasional, outer edges of cattail marsh.

BUTOMACEAE

*I *Butomus umbellatus* L.
Common, edges of marsh & shorelines in water to 1/2 m deep.

HYDROCHARITACEAE

Elodea canadensis Michx.
Common, in water to 2 m deep.

* *Vallisneria americana* Michx.
Common, boat cannel and lower portion of river.

*I *Hydrocharis morsus-ranae* L.
Common, edge of main marsh and east shore

POACEAE

I *Agropyron repens* (L.) Beauv.
Common, open meadows, pastures & disturbed areas

* *Agrostis hyemalis* (Walt.) BSP.
Occasional, granite outcrops and islands in the marsh.

* *Agrostis perennans* (Walt.) Tuckerm.
Rare, semi-open areas on west granite outcrop.

I *Agrostis stolonifera* L.
Common, open meadows, pastures, wet meadows.

Agrostis gigantea Roth.
Common, wet meadows.

* *Alopecurus aequalis* Sobol.
Occasional, edges of islands on the east side of the river and elsewhere in the marsh.

I *Alopecurus pratensis* L.
Rare, moist ditch near Hwy. 401.

I *Avena sativa* L.
Rare, along the railway tracks.

Brachyelytrum erectum (Schreb.) Beauv.
Rare, granite outcrop in woods.

Bromus ciliatus L.
Common, meadows.

I *Bromus inermis* Leyss.
Common, meadows.

I *Bromus tectorum* L.
Rare, along the railway and bank near the quarry.

* *Calamagrostis canadensis* (Michx.) Beauv.
Common, wet meadows and marsh.

Cinna arundinacea L.
Rare, moist woods near the Fingers.

Cinna latifolia (Trev.) Griseb.
Occasional, moist woods.

I *Dactylis glomerata* L.
Common, open ground.

* *Danthonia spicata* (L.) Beauv.
Common, granite outcrops and islands in the marsh.

* *Deschampsia flexuosa* (L.) Trin.
Rare, open areas on granite outcrop.

I *Digitaria ischaemum* (Schreb.) Muhl.
Rare, disturbed open ground

I *Digitaria sanguinalis* (L.) Scop.
Rare, disturbed open ground.

I *Echinochloa crusgalli* (L.) Beauv.
Rare, disturbed open ground.

Echinochloa wiegandii (Fassett) McNeill & Dore
Rare, edge of the main marsh at the NW corner.

* *Echinochloa microstachya* (Wieg.) Rydb.
Rare, disturbed open ground near quarry.

* *Elymus canadensis* L.
Rare, Bells Island and railway track.

Elymus virginicus L.
Common, shorelines and woodland edges.

Eragrostis pectinacea (Michx.) Nees
Rare, picnic area Bells Island.

I *Eragrostis poaeoides* Beauv.
Rare, shore west of Bells Island.

I *Festuca arundinacea* Schreber
Rare, meadow near Hwy. 401 on east side.

* *Festuca rubra* L.
Common, especially on marsh islands and the Fingers.

* *Glyceria canadensis* (Michx.) Trin.
Occasional, marsh edge.

* *Glyceria grandis* S. Wats.
Common, marsh edges and shores.

*I *Glyceria maxima* (Hartm.) Holmb.
Common, marsh edges and shores in water to 0.5 m deep.

* *Glyceria striata* (Lam.) Hitchc.
Occasional, moist shaded areas at edge of marsh

* *Hierochloe odorata* (L.) Beauv.
Rare, railway tracks on west side.

I *Hordeum jubatum* L.
Occasional, disturbed ground.

* *Hystrix patula* Moench.
Common, wooded areas especially on east side.

Leersia oryzoides (L.) Sw.
Occasional, wet meadows.

Leersia virginica Willd.
Rare, depressions in deciduous woods on east side.

I *Lolium multiflorum* Lam.
Rare, distrubed ground on east side near quarry.

I *Lolium perenne* L.
Rare, railway tracks.

Milium effusum L.
Rare, woods on east side near quarry.

Muhlenbergia mexicana (L.) Trin.
Common, distrubed wooded areas.
Oryzopsis asperifolia Michx.
Rare, dry oak woods on granite at north end.
* *Panicum capillare* L.
Occasional, dry open ground, west granite ridge.
* *Panicum depauperatum* Muhl. var. *involutum* (Torrey) A. Wood
Rare, dry woods on west limestone outcrop.
* *Panicum implicatum* Scribner (*P lanuginosum* var. *implicatum*)
Occasional, open gravelly areas.
* *Panicum lanuginosum* Elliot var. *fasciculatum* (Torrey) Fern.
Rare, granite ridge top on west side of the river.
Panicum linearifolium Scribner
Occasional, dry granite ridge, islands and promontories in the marsh.
Panicum tuckermanii Fern.
Rare, open areas on west granite outcrop.
Panicum xanthophysum A. Gray
Rare, in dry oak-pine woods on west granite ridge.
* *Phalaris arundinacea* L.
Common, marsh and wet meadow.
I *Phleum pratense*
Common, meadows and open ground.
Phragmites australis (Cav.) Steudel (*P. communis*)
Occasional, main marsh and east side.
*I *Poa annua* L.
Occasional, disturbed ground, Bells Island.
I *Poa compressa* L.
Common, dry rock outcrops and pastures.
* *Poa palustris* L.
Common, wet meadows.
* *Poa pratensis* L.
Common, open meadows and open woods!
I *Puccinellia distans* (L.) Parl.
Rare, disturbed open ground below quarry.
Schizachne purpurascens (Torr.) Swallen
Rare, dry granite ridge south of locks.
I *Setaria glauca* (L.) Beauv.
Rare, railway tracks.
I *Setaria viridis* (L.) Beauv.
Common, open ground.
Sphenopholis intermedia (Rydb.) Rydb.
Occasional, wet meadows.
Sporobolus neglectus Nash
Rare, open dry portion of meadow west of Bells Island
Sporobolus vaginiflorus (Torr.) Wood
Rare, open dry portion of meadow west of Bells Island.
Torreyochloa pallida (Torrey) Church var. *fernaldii* (A.S. Hitchc.)
Dore ex
Koyama & Kawano
Rare, moist swampy woods near the Fingers.
* *Trisetum triflorum* (Bigel.) A.& D. Love ssp. *molle* (Hultén) A.& D. Love
Occasional, on the marsh islands.
* *Zizania palustris* L. var. *palustris* (*Z. angustifolia*)
Occasional, in the marsh channels.

CYPERACEAE

* *Carex amphibola* Steudel var. *turgida* Fern.
Rare, disturbed woods south of Barkers Point.

* *Carex aquatilis* Wahl.
Common, marsh and wet meadows.

Carex arctata Boott
Occasional, deciduous woods.

* *Carex artitecta* Mack. (*C. nigromarginata* var. *muhlenbergii*)
Rare, dry open locations on marsh islands and promontories.

* *Carex atherodes* Spreng.
Occasional, marsh and wet meadows.

* *Carex bebbii* Olney
Damp area on west granite ridge, status uncertain.

* *Carex blanda* Dewey
Occasional, east limestone outcrop.

Carex brevior (Dewey) Mack.
Wet meadow north of the Fingers. Status in the study area uncertain.

* *Carex cephalophora* Willd.
Occasional, deciduous woods over limestone.

* *Carex communis* Bailey
Occasional, wooded areas

* *Carex comosa* Boott
Common, marsh.

Carex crinita Lam.
Common, marsh and marsh edges.

* *Carex cumulata* (Bailey) Mack.
Occasional, west granite outcrop.

Carex deweyana Schw.
Rare, woods on east side.

* *Carex diandra* Schrank
Floating mats and edges of the main marsh at the south end, status uncertain.

Carex eburnea Boott
Rare, open slope near the Fingers.

* *Carex foenea* Willd. (*C. siccata*).
Rare, islands in the marsh west of the river.

Carex gracillima Schw.
Rare, deciduous woods.

* *Carex granularis* Willd.
Common, open and often distrubed areas.

Carex hystricina Muhl.
Occasional, wet meadows.

* *Carex lacustris* Ehrh.
Common, marsh edges.

* *Carex lanuginosa* Michx.
Occasional, marsh edges.

* *Carex lasiocarpa* Ehrh.
Common, floating mats in the marshes.

Carex laxiflora Lam.
Occasional, deciduous woodlands.

* *Carex Leptonervia* Fern.
Occasional, woods on east side.

* *Carex leptalea* Wahl.
Rare, boggy depression near the Fingers.

*I *Carex pallescens* L.
Rare, low meadow near Barkers Point.

Carex pedunculata Muhl.
Common, wooded areas

* *Carex pensylvanica* Lam.
Common, dry wooded areas, crests of outcrops.

Carex plantaginea Lam.
Rare, deciduous woods on east side.

* *Carex prairea* Dewey
Wet meadows North of the Fingers, status in the area uncertain.

* *Carex pseudo-cyperus* L.
Common, marsh.

* *Carex radiata* (Wahl.) Small (*C. rosea* of recent authors).
Occasional, wooded areas.

* *Carex retrorsa* Schw.
Occasional, edges of marsh.

Carex rosea Schkuhr (*C. convoluta* of recent authors).
Occasional, wooded areas.

* *Carex rugosperma* Mack.
Rare, open barren ground on top of west granite outcrop at north end.

* *Carex sartwellii* Dewey
Rare, near edges of main marsh at south end and along railway.

* *Carex sparganioides* Willd.
Rare, island on east side of marsh south of Hwy. 401.

*I *Carex spicata* Huds.
Common, woods and pastures.

* *Carex stipata* Willd.
Common, wet meadows.

* *Carex stricta* Lam.
Common, marsh & wet meadow.

Carex tenera Dewey
Common, wet meadows and wet woods.

* *Carex tribuloides* Wahl.
Occasional, wet meadows.

Carex tuckermanii Boott
Rare, swampy wood near the Fingers.

Carex umbellata Schkuhr
Occasional, dry granite ridge top and dry open areas on islands and promontories.

Carex vesicaria L.
Occasional, wet meadow and marsh.

Carex viridula Michx.
Rare, wet meadow south of Hwy. 401 on east side of river.

Cyperus rivularis Kunth
Rare, only on a sandy beach on Bells Island.

* *Cyperus strigosus* L.
Rare, dredge spoil along the upper river.

Eleocharis acicularis (L.) R.& S.
Common, main *Typha* marsh and along rocky shore of upper river where exposed in late summer and fall.

Eleocharis elliptica Kunth
Common, marsh and wet meadows.

Eleocharis erythropoda Steud.
Common, marsh and wet meadow.

* *Eleocharis obtusa* (Willd.) Schult. (*E. ovata*)
Occasional, muddy areas becoming dry in late summer and on dredge spoil.
* *Eleocharis smallii* Britton (*E. palustris*)
Common, marsh edges in water to 1/2 m deep.
Scirpus acutus Muhl.
Common, marsh and marsh edges in water to 1/2 m deep.
Scirpus pungens Vahl. (*S. americanus*)
Common, drier portions of marsh and marsh edges.
Scirpus cyperinus (L.) Kunth
Rare, in a spikerush marsh with Buttonbush on north side of Hwy. 401 west of the river.
* *Scirpus fluviatilis* (Torr.) Gray
Common, marsh edges and shore in water to 1/2 m deep.
* *Scirpus validus* Vahl
Common, marsh and marsh edges in water to 1/2 m deep.

ARACEAE
* *Acorus calamus* L. *sensu lato*
Common, marsh and wet meadows.
* *Arisaema triphyllum* (L.) Schott
Common, deciduous woods.
* *Calla palustris* L.
Occasional, *Typha* marsh on floating mats and boggy depression near the Fingers.

LEMNACEAE
* *Lemna minor* L.
Common, floating in marsh channels, pools and sheltered bays.
* *Lemna trisulca* L.
Common, marsh and edge of river.
* *Spirodela polyrhiza* (L.) Schleiden
Common, marsh areas.
* *Wolffia columbiana* Karst.
Occasional, sheltered pools in marsh.
* *Wolffia borealis* (Engelm.) Landolt (*W. punctata*)
Occasional, sheltered pools in marsh, very common in NW corner.

PONTEDERIACEAE
Pontederia cordata L.
Rare, edge of lower marsh on west side of Cataraqui River.
* *Heteranthera* (*Zosterella*) *dubia* (Jacq.) Small
Common, in water to 2 m deep.

JUNCACEAE
Juncus alpinoarticulatus Chaix. *in* Villars (*J. alpinus*)
Rare, east shore north of Barkers Point.
Juncus dudleyi Wieg.
Common, wet meadows, shores and disturbed open places.
Juncus effusus L.
Occasional, wet meadows, pastures and shores.
* *Juncus secundus* Beauv.
Rare, open granite ridge-top on west side of the upper Cataraqui River.
* *Juncus tenuis* Willd.
Common, pasture and disturbed open ground.

* *Juncus vaseyi* Engelm.
Rare, open granite ridge top on west side of upper Cataraqui River.
Luzula acuminata Raf.
Rare, dry open ground on granite ridge and islands in the marsh.
Luzula multiflora (Retz.) Lej. (*L. campestris*)
Occasional, dry open ground on granite ridge and islands in the marsh.

LILIACEAE
Allium canadense L.
Rare, base of west granite outcrop.
Allium tricoccum Ait.
Occasional, deciduous woods on east side.
Asparagus officinalis L.
Rare, along the railway.
Clintonia borealis (Ait.) Raf.
Rare, rocky woods on granite outcrop.
I *Convallaria majalis* L.
Rare, spreading from old home side south of Barkers Point.
* *Erythronium americanum* Ker.
Common, wooded areas throughout.
*I *Hemerocallis flava* L.
Occasional, south of Barkers Point and along the railway.
Maianthemum canadense Desf. var. *interius* Fern.
Common, dry crests of islands and promontories and granite outcrops.
*I *Ornithogallum umbellatum* L.
A few plants persisting south of Barkers Pt.
Polygonatum pubescens (Willd.) Pursh
Occasional, deciduous woods.
* *Smilacina racemosa* (L.) Desf.
Occasional, deciduous woods
Smilacina stellata (L.) Desf.
Occasional, islands in the marsh and granite outcrop. *Also along the railway.*
Smilax herbacea *L.*
Rare, Bells island.
Streptopus roseus *Michx.*
Rare, deciduous woods on east side.
* Trillium erectum *L.*
Common, deciduous woods.
* Trillium grandiflorum *(Michx.) Salisb.*
Common, deciduous woods, mostly Sugar Maple dominated.
Uvularia grandiflora *Sm.*
Occasional, wooded areas.
* Uvularia sessilifolia *L.*
Rare, North Woods.

IRIDACEAE
I Iris pseudacorus *L.*
Rare, edge of marsh near railway
Iris versicolor *L.*
Rare, main marsh edges
Sisyrinchium montanum *Greene*
Occasional, meadows and marsh edges.

ORCHIDACEAE

*I *Epipactis helleborine* (L.) Crantz
Occasional, wooded areas.

Platanthera hyperborea L.
Rare, edge of spring near the Fingers.

SALICACEAE

Populus balsamifera L.
Common, wood at north end.

Populus deltoides Marsh.
Common, shores and disturbed places.

* *Populus grandidentata* Michx.
Common, woods at north end and granite outcrops.

Populus tremuloides Michx.
Common, especially at north end.

* *Salix bebbiana* Sarg.
Rare, marsh.

* *Salix discolor* Muhl.
Rare, marsh edge.

*I *Salix fragilis* L.
Occasional, shores of lower river.

* *Salix nigra* L.
Occasional, shores of lower river.

* *Salix petiolaris* Sm.
Rare, marsh edge.

JUGLANDACEAE

* *Carya cordiformis* (Wang.) K. Koch
Occasional, wooded areas.

* *Carya ovata* (Mill.) K. Koch
Common, both granitic & limestone outcrops.

Juglans cinerea L.
Rare, along limestone outcrop on east side.

BETULACEAE

Alnus rugosa (Du Roi) Spreng.
Occasional, around springs on marsh edges.

Betula lutea Michx. f. (*B. alleghenienses*)
Occasional, wooded areas.

Betula papyrifera Marsh.
Occasional, especially in wood at north end and on granite outcrops.

* *Carpinus caroliniana* Walt.
Common, wooded areas throughout.

Corylus cornuta Marsh
Occasional, wooded areas in dry places, mostly under oak.

* *Ostrya viginiana* (Mill.) K. Koch
Common, wooded areas throughout.

FAGACEAE

Fagus grandifolia Ehrh.
Common, wooded areas throughout.

* *Quercus alba* L.
Common, dry woods and outcrops.

* *Quercus borealis* Michx. f.
Common, dominant in some dry woods around the marsh, and on islands and outcrops.

* *Quercus macrocarpa* Michx.
Common, limestone escarpments and islands and promontories in the marsh.
* *Quercus muhlenbergii* Engelm.
Rare, four trees on top of limestone outcrop south of Hwy. 401.

ULMACEAE
* *Ulmus americana* L.
Common, moist wooded areas.
Ulmus rubra Muhl.
Occasional, mostly on the west limestone outcrop.

URTICACEAE
Boehmeria cylindrica (L.) Sw.
Rare, moist woods.
Laportea canadensis (L.) Wedd.
Rare, depression in North Woods.
Parietaria pensylvanica Muhl.
Rare, moist woods and slopes near the Fingers.
Pilea pumila (L.) Gray
Rare, moist woods on east side north of quarry.
Urtica dioica L. ssp. *dioica*
Occasional, marsh edges.
*I *Urtica dioica* L. ssp. *procera* Wedd.
Common, marsh edges and disturbed open areas.

SANTALACEAE
Comandra umbellata (L.) Nutt.
Occasional, granite ridges and the islands.

ARISTOLOCHIACEAE
* *Asarum canadense* L.
Common, in deciduous woods over limestone on either side of the lower river.

POLYGONACEAE
I *Fagopyrum esculentum* Moench
Rare, along the railway.
Polygonum aviculare L.
Common, disturbed open ground.
* *Polygonum amphibium* L. var. *emersum* Michx.
Occasional, edges of the marsh.
*I *Polygonum convolvulus* L.
Rare, along the railway.
*I *Polygonum cuspidatum* Sieb.
Rare, slope of gravel pit on east side.
* *Polygonum douglasii* Greene
Rare, on dry granite ridge on west side of upper Cataraqui River.
Polygonum hydropiper L.
Rare, low wet areas on east side.
* *Polygonum lapathifolium* L.
Occasional, shorelines.
I *Polygonum persicaria* L.
Rare, open wet ground.
* *Polygonum punctatum* Ell.
Rare, moist depressions in North and Northwest woods.

* *Polygonum sagittatum* L.
Occasional, moist woodland edges.
*I *Rumex acetosella* L.
Occasional, dry granite ridge tops and the islands.
I *Rumex crispus* L.
Common, wet meadows and disturbed open ground.
Rumex orbiculatus Gray
Occasional, in cattail marsh.

CHENOPODIACEAE
Atriplex prostrata Buch. (*A. hastata*)
Rare, disturbed, open ground
Atriplex patula L.
Rare, disturbed open ground.
I *Chenopodium album* L.
Occasional, disturbed open ground.
I *Chenopodium glaucum* L.
Rare, disturbed open ground.
Chenopodium hybridum L.
Occasional, in deciduous woods over limestone
I *Salsola kali* L. var. *tenuifolia* G.F.W. Meyer
Rare, along the railway.
I *Amaranthus retroflexus* L.
Rare, pasture in northeast sector.

PORTULACACEAE
* *Claytonia caroliniana* Michx.
Common, wooded areas.
* *Claytonia virginica* L.
Common, wooded areas.
I *Portulaca oleracea* L.
Rare, weedy shore west of Bells Island.

CARYOPHYLLACEAE
I *Arenaria serpyllifolia* L.
Occasional, gravelly open ground.
Cerastium nutans Raf.
Rare, dry limestone area on east side.
I *Cerastium vulgatum* L.
Common, pasture and disturbed open ground.
I *Dianthus armeria* L.
Rare, pastures.
* *Moehringia lateriflora* (L.) Fenzl. (*Arenaria lateriflora*)
Common, woods and thickets.
I *Saponaria officinalis* L.
Occasional, along the railway and gravel pit slopes.
Silene antirrhina L.
Rare, disturbed open ground.
I *Silene cucubalus* Wibel
Occasional, pasture and open ground.
I *Silene pratensis* (Raf.) Godron and Gren. (*Lychnis alba*)
Rare, along the railway.
* *Stellaria calycantha* (Ledeb.) Bongard
Rare, Hawthorns on west side.

I *Stellaria graminea* L.
Rare, pasture at north end.
I *Stellaria media* (L.) Cyrillo
Occasional, disturbed open ground.

CERATOPHYLLACEAE

* *Ceratophyllum demersum* L.
Common, in water to 2 m deep.

NYMPHAEACEAE

Nuphar variegatum Engelm.
Common, water to 1 m deep and deeper marsh
* *Nymphaea tuberosa* Paine
Common, water to 2 m deep.

RANUNCULACEAE

Actaea alba (L.) Mill.
Occasional, wooded areas.
* *Actaea rubra* (Ait.) Willd.
Occasional, wooded areas.
* *Anemone canadensis* L.
Occasional, marsh edges.
* *Anemone quinquefolia* L.
Rare, on islands in the marsh under Red Oak.
* *Anemone virginiana* L.
Occasional, marsh edges.
Aquilegia canadensis L.
Occasional, granite ridges and west limestone outcrop.
I *Aquilegia vulgaris* L.
Rare, persisting south of Barkers Point.
* *Caltha palustris* L.
Rare, boggy depression near the Fingers.
Clematis virginiana L.
Rare, moist woods near the Fingers.
Hepatica acutiloba DC.
Occasional, deciduous woods on east side.
Hepatica americana (DC.) Ker.
Occasional, granite outcrops and dry crests of islands.
* *Ranunculus abortivus* L.
Common, deciduous woods.
*I *Ranunculus acris* L.
Common, pastures and open places.
* *Ranunculus longirostris* Godr.
Common, in shallow water around edge of marsh.
* *Ranunculus pensylvanicus* L.
Occasional, marsh edges.
Ranunculus sceleratus L.
Occasional, ditches and shores.
Thalictrum dioicum L.
Common, deciduous woods.
Thalictum polygamum Muhl.
Occasional, marsh edges and wet meadow.

BERBERIDACEAE

I *Berberis thunbergii* DC.
Rare, pasture north of Barkers Point.

*I *Berberis vulgaris* L.
Occasional, pastures and open woods.

* *Caulophyllum thalictroides* (L.) Michx.
Occasional, woods on east side and North Woods.

* *Jeffersonia diphylla* (L.) Pers.
Rare, limestone talus slope on west side and on a far western island in the marsh.

* *Podophyllum peltatum* L.
Occasional, open woods.

PAPAVERACEAE

I *Chelidonium majus* L.
Occasional, deciduous woods on east side.

* *Sanguinaria canadensis* L.
Occasional, deciduous woods on west side, Bells Island, and along the railway.

FUMARIACEAE

* *Corydalis aurea* Willd.
Rare, along the railway north of Hwy. 401.

* *Corydalis sempervirens* (L.) Pers.
Rare, granite outcrop on west side of upper river.

Dicentra canadensis (Goldie) Walp.
Rare, deciduous woods over shallow limestone near Barkers Point.

Dicentra cucullaria (L.) Bernh.
Rare, deciduous woods over limestone outcrop on east side.

BRASSICACEAE

I *Alliaria petiolata* (Bieb.) Cavara & Grande (*A. officinalis*)
Common, on slopes of limestone outcrops.

* *Arabis divaricarpa* A. Nels.
Occasional, open diciduous woods on east side and granite outcrops.

I *Barbarea vulgaris* R. Br.
Occasional, meadows and pastures.

I *Berteroa incana* (L.) DC.
Rare, along the railway.

I *Capsella bursa-pastoris* (L.) Medic.
Occasional, pastures and meadows.

Dentaria diphylla Michx.
Occasional, Sugar Maple woods over limestone.

Dentaria laciniata Muhl.
Occasional, Sugar Maple woods over limestone.

* *Dentaria X maxima* Nutt.
Rare, limestone talus under Sugar Maple on east side.

* *Descurania pinnata* (Walt.) Britt. var. *brachycarpa* (Richards.) Fern.
Rare, in gravel along the railway.

I *Diplotaxis tenuifolia* (L.) DC.
Occasional, in gravel along the railway.

I *Erucastrum gallicum* (Willd.) O.E. Schulz
Rare, along the railway.

I *Erysimum cheiranthoides* L.
Rare, disturbed open ground.

I *Erysimum hieracifolium* L.
Rare, open disturbed area near railway at north end of west granite outcrop, and along west shore of Bells Island.

I *Hesperis matronalis* L.
Common, moist woods.

I *Lepidium densiflorum* Schrader
Rare, open gravelly ground.

*I *Nasturtium officinale* R. Br.
Rare, springs beside railway in main marsh.

Rorippa islandica (Oeder) Borbas var. *hispida* (Desv.) Butters and Abbe
Rare, shore west of Bells Island.

I *Sinapis arvensis* L. (*Brassica kaber*)
Rare, weedy shore west of Bells Island.

I *Sysimbrium officinale* (L.) Scop.
Rare, open disturbed woods south of Barkers Point.

I *Thlaspi arvense* L.
Rare, pastures.

I *Thlaspi perfoliatum* L.
Rare, pasture north of Barkers Point.

CRASSULACEAE

Penthorum sedoides L.
Occasional, seasonally wet open ground.

*I *Sedum acre* L.
Rare, on west granite outcrop at north end.

*I *Sedum telephium* L.
Rare, on west granite outcrop at north end.

SAXIFRAGACEAE

Mitella diphylla L.
Rare, moist limestone talus on east side near the Fingers.

* *Ribes americanum* Mill.
Occasional, deciduous woods on talus of east limestone outcrop.

* *Ribes cynosbati* L.
Occasional, wooded areas.

Ribes hirtellum Michx.
Occasional, wooded areas.

*I *Ribes sativum* Syme
Rare, established in Barkers Point Area.

* *Saxifraga virginiensis* Michx.
Occasional, open areas on granite ridges

Tiarella cordifolia L.
Occasional, deciduous woodland

HAMAMELIDACEAE

Hamamelis virginiana L.
Rare, dry open woods at north end.

ROSACEAE

Agrimonia gryposepala Wallr.
Occasional, deciduous woods on east side.

Amelanchier alnifolia Nutt. var. *compacta* (Nielsen) McKay
Rare, granitic ridge and Bells Island.

* *Amelanchier arborea* (Michx. f.) Fern. ssp. *arborea*
Occasional, deciduous woods.

* *Amelanchier sanguinea* (Pursh.) DC. var. *sanguinea*
Occasional, edges of woods and clearing.

* *Aronia prunifolia* (Marsh) Rehder
Rare, boggy depression near the Fingers.

* *Crataegus brainerdii* Sarg.
Rare, found only along the railway south of hwy. 401.

* *Crataegus chrysocarpa* Ashe
Common, throughout in woods, fencerows, and pastures.

* *Crataegus chrysocarpa* Ashe var. *aboriginum* (Sarg.) Kruschke
Status uncertain, old field at 823025.

* *Crataegus chrysocarpa* Ashe var. *phoenica* Palmer
Status uncertain, along railway on west side.

* *Crataegus flabellata* (Bosc. *ex* Spach.) K. Koch
Occasional, south end of main marsh area on the east side.

* *Crataegus macrantha* Lodd.
Common, throughout in woods, fencerows and pastures.

* *Crataegus pedicellata* Sarg.
Occasional, east side of old ferry trail near hwy. 401 and on east side of marsh.

* *Crataegus punctata* Jacq.
Common, especially on west side of marsh.

* *Crataegus submollis* Sarg.
Common, on granite outcrops and along the east limestone outcrop.

* *Fragaria virginiana* Duchesne
Common, open meadows, pasture and open ground.

* *Geum canadense* Jacq.
Common, deciduous woods.

Potentilla anserina L.
Rare, east shore near Barkers Point.

*I *Potentilla intermedia* L.
Common, dry open ground.

* *Potentilla norvegica* L.
Occasional, dry open ground.

* *Potentilla palustris* (L.) Scop.
Occasional, main marsh.

*I *Potentilla recta* L.
Occasional, dry open ground.

* *Potentilla simplex* Michx.
Occasional, dry open ground.

*I *Prunus interstitia* L.
Rare, Bells Island and around fields.

Prunus nigra Ait.
Rare, deciduous woodland edge near the quarry.

Prunus pensylvanica L.f.
Rare, deciduous and mixed wood.

Prunus serotina Ehrh.
Common, deciduous woods.

Prunus virginiana L.
Common, deciduous woods.

I *Pyrus malus* L.
Rare, Barkers Point.

* *Rosa acicularis* Lindl.
Rare, along the railway banks.

Rosa blanda Ait.
Occasional, on islands in the marsh and dry slopes.

*I Rosa multiflora Thunb.
Rare, but locally frequent in pasture area north of Barkers Point.
*I Rosa rubrifolia Vill.
Rare, pasture north of Barkers Point.
* Rubus allegheniensis Porter
Common, open woods.
* Rubus flagellaris L.
Rare, open places on west granitic outcrop. Few plants flowered, but those that did were more like R. flagellaris than R. arundelanus.
* Rubus odoratus L.
Occasional, open woods.
* Rubus strigosus Michx.
Occasional, open woods.
Spiraea alba Du Roi
Common, wet meadows and marsh edges.
Waldsteinia fragarioides (Michx.) Tratt.
Common, dry open wooded areas.

FABACEAE
* Amphicarpa bracteata (L.) Fern. var. comosa (L.) Fern.
Edges of Typha marsh on west side of river north of Hwy 401 bridge. The status of this and the typical variety in the area is uncertain.
I Coronilla varia L.
Rare, beside Hwy. 401.
* Lathyrus palustris L.
Common, marsh.
Lespedeza hirta (L.) Hornem.
Rare, along the railway.
I Lotus corniculatus L.
Occasional, disturbed open ground and pastures.
I Medicago lupulina L.
Common, disturbed open ground.
I Medicago sativa L.
Rare, pasture at NE corner.
I Melilotus alba Desr.
Common, disturbed open ground.
I Melilotus officinalis (L.) Desr.
Occasional, disturbed open ground.
*I Trifolium aureum Pollich (T. agrarium)
Occasional, dry crests of islands in the marsh and west granite outcrop.
I Trifolium hybridum L.
Occasional, pasture at north end.
I Trifolium pratense L.
Common, disturbed open ground and pastures.
I Trifolium repens L.
Common, disturbed open ground and pasture.
Vicia cracca L.
Common, open disturbed ground, meadows and marsh edges.
*I Vicia tetrasperma (L.) Moench.
Rare, dry open meadows near islands at north end on east side.

OXALIDACEAE
* Oxalis stricta L.
Rare, disturbed open ground.

GERANIACEAE

* *Geranium maculatum* L.
Common, deciduous woods.

Geranium robertianum L.
Common, rocky slopes on both granite and limestone outcrops.

RUTACEAE

Zanthoxylum americanum Mill.
Common, thickets and woodland edges on clay or limestone.

POLYGALACEAE

Polygala pauciflora Willd.
Rare, west granite outcrop.

* *Polygala senega* L.
Rare, base of west limestone outcrop along railway bank.

EUPHORBIACEAE

* *Acalypha rhomboidea* Raf.
Rare, moist mucky depression in the Fingers area.

I *Euphorbia cyparissias* L.
Rare, along the railway.

ANACARDIACEAE

* *Rhus aromatica* Ait.
Rare, Bells Island and granite ridge.

Rhus radicans L. var. *rydbergii* (Small) Rehder
Occasional, along the railway.

* *Rhus typhina* L.
Common, edges of woods and old pasture.

AQUIFOLIACEAE

* *Ilex verticillata* (L.) Gray
Occasional, mucky depression in NW woods, marsh edges and bogy pocket near the Fingers.

CELASTRACEAE

Celastrus scandens L.
Occasional, exposed slopes of limestone outcrops and along the railway.

STAPHYLEACEAE

* *Staphylea trifoliata* L.
Occasional, talus slopes of limestone outcrops.

ACERACEAE

I *Acer negundo* L.
Common, disturbed areas, shores of lower river.

Acer nigrum Michx. f.
Common, along east limestone outcrop.

Acer rubrum L.
Occasional, mostly on granite outcrops.

Acer saccharum Marsh
Common, wooded areas, dominant in the deciduous woods along the limestone outcrops.

* *Acer spicatum* Lam.
Rare, limestone talus in the Fingers area.

BALSAMINACEAE

Impatiens biflora Walt.
Common, marsh, wet meadows and wet wooded areas.

* *Impatiens pallida* Nutt.
Rare, wooded limestone talus near the Fingers.

RHAMNACEAE

Ceanothus americanus L.
Rare, an island on west side of the river.

*I Rhamnus catharticus L.
Common, disturbed wooded areas.

I Rhamnus frangula L.
Rare, disturbed wooded area south of Barkers Point.

VITACEAE

Parthenocissus quinquefolia (L.) Planch.
Common, woodland edges and clearings.

Vitis riparia Michx.
Common, woodland edges and clearings.

TILIACEAE

Tilia americana L.
Common, deciduous woods and along the base of granite outcrops beside the upper river.

MALVACEAE

*I Abutilon theophrasti Medic.
Rare, on dredge heap below the locks.

I Malva moschata L.
Rare, open gravelly soil at the limestone quarry.

I Malva neglecta Wallr.
Rare, disturbed open ground near Barkers Point.

HYPERICACEAE

I Hypericum perforatum L.
Common, pastures and disturbed open ground.

* Hypericum punctatum Lam.
Occasional, thickets and woods on islands and promontories.

VIOLACEAE

Viola canadensis L.
Rare, deciduous woods on east side near quarry.

* Viola conspersa Reichenb.
Occasional, moist open woods.

* Viola papilionacea Pursh
Occasional, moist open woods.

Viola pubescens Ait.
Occasional, deciduous woods.

* Viola septentrionalis Greene
Occasional, Bells Island and islands in the marsh.

* Viola sororia Willd.
Occasional, deciduous woods over limestone.

ELAEAGNACEAE

* *Shepherdia canadensis* (L.) Nutt.
Rare, edge of North Woods and along eastern limestone outcrop.

LYTHRACEAE

I *Lythrum salicaria* L.
Common, inner marsh edges and wet meadows.

ONAGRACEAE

* *Circaea quadrisulcata* (Maxim.) Franch. & Sav.
Rare, deciduous woods below east limestone outcrop.

* *Epilobium glandulosum* Lehm.
In the marsh, status uncertain.

I *Epilobium hirsutum* L.
Occasional, drier edges of the marsh.

Ludwigia palustris (L.) Ell.
Rare, marsh.

Oenothera biennis L.
Occasional, disturbed open ground.

Oenothera parviflora L.
Rare, disturbed open ground.

HALORAGIDACEAE

* *Myriophyllum exalbescens* Fern.
Occasional, marsh channels and south of main marsh in water to 2 m deep.

*I *Myriophyllum spicatum* L.
Common, throughout the Cataraqui River in water to 2 m deep. Not known in the Kingston region in 1970 (Beschel et al., 1970).

ARALIACEAE

* *Aralia hispida* Vent.
Rare, in open areas at south end of west granite outcrop.

Aralia nudicaulis L.
Rare, wooded area on west granite outcrop.

Aralia racemosa L.
Rare, moist wooded slope on east granite outcrop.

APIACEAE

Cicuta bulbifera L.
Common, marsh.

Cicuta maculata L.
Occasional, marsh.

Cyptotaenia canadensis (L.) DC.
Occasional, deciduous woods on east side.

I *Daucus carota* L.
Common, disturbed open ground.

Heracleum lanatum Michx.
Rare, edge of moist pasture north of the Fingers and Bells Island.

Osmorhiza claytoni (Michx.) Clarke
Occasional, deciduous woods over limestone.

Osmorhiza longistylis (Torr.) DC.
Occasional, deciduous woods over limestone.

I *Pastinaca sativa* L.
Occasional, pasture at north end and along railway and Bells Island.

* *Sanicula marilandica* L.
Rare, low woods in the Fingers area.
* *Sium suave* Walt.
Occasional, marsh.
* *Taenidia integerrima* (L.) Drude
Occasional, granite ridge, east limestone outcrop and Bells Island.

CORNACEAE
Cornus alternifolia L.f.
Occasional, deciduous woods.
* *Cornus obliqua* Raf. (*C. amomum* ssp. *obliqua*)
Common, woodland edges of marsh and old fields.
* *Cornus racemosa* Lam.
Common, open limestone outcrops, islands and old fields.
* *Cornus stolonifera* Michx.
Occasional, woodland edges of the marsh.

ERICACEAE
* *Arctostaphylos uva-ursi* (L.) Spreng.
Rare, only on high open top of west granite outcrop at north end.
Gaultheria procumbens L.
Occasional, granite outcrops and higher islands.
* *Monotropa uniflora* L.
Rare, under oak on west granite outcrop.
Pyrola elliptica Nutt.
Rare, granite outcrops and wooded slope near the Fingers.
* *Vaccinium angustifolium* Ait.
Common, dry tops of granite outcrops and higher crests of islands and promontories.

PRIMULACEAE
Lysimachia ciliata L.
Common, wooded areas and woodland edges.
I *Lysimachia nummularia* L.
Occasional, wet woods on east side and at north end.
* *Naumbergia thyrsiflora* (L.) Duby
Common, marsh.

OLEACEAE
* *Fraxinus americana* L.
Common, wooded areas throughout.
* *Fraxinus nigra* Marsh
Rare, boggy depression in the Fingers area.
Fraxinus pennsylvanica Marsh
Rare, low woods in the Fingers area and at north end.
*I *Ligustrum vulgare* L.
Rare, persisting long after cultivation south of Barkers Point.
I *Syringa vulgaris* L.
Rare, persisting and spreading south of Barkers Point, and at the north end of the west granite ridge.

GENTIANACEAE
* *Menyanthes trifoliata* L.
Rare, in the main marsh on floating sedge mats.

APOCYNACEAE

* *Apocynum androsaemifolium* L.
Rare, on west granite outcrop and along the railway.

ASCLEPIADACEAE

Asclepias incarnata L.
Common, marshes and wet meadows.

* *Asclepias syriaca* L.
Common, open disturbed areas and pastures.

CONVOLVULACEAE

I *Convolvulus arvensis* L.
Rare, along the railway.

* *Convolvulus sepium* L.
Common, marsh edges and wet meadows.

* *Cuscuta gronovii* Willd.
Occasional, on marsh vegetation.

POLEMONIACEAE

Phlox divaricata L.
Rare, deciduous woods over limestone on east side.

HYDROPHYLLACEAE

Hydrophyllum virginianum L.
Occasional, deciduous woodlands.

BORAGINACEAE

I *Cynoglossum officinale* L.
Occasional, disturbed woods on east side.

I *Echium vulgare* L.
Common, open disturbed areas.

I *Lithospermum officinale* L.
Occasional, pasture at north end.

VERBENACEAE

Verbena hastata L.
Common, Bluejoint marsh.

Verbena urticifolia L.
Common, Bluejoint marsh and woodland edges.

LAMIACEAE

*I *Glecoma hederacea* L.
Occasional, disturbed open woods.

* *Hedeoma hispida* Pursh
Rare, disturbed open ground near quarry.

*I *Leonurus cardiaca* L.
Common, disturbed open areas.

Lycopus americanus Muhl.
Common, marsh.

Lycopus uniflorus Michx.
Common, marsh.

Mentha arvensis L.
Occasional, marsh and marsh edges.

I *Nepeta cataria* L.
Common, disturbed open ground.

* *Prunella vulgaris* L.
Common, moist open woods and clearing throughout.

Satureja vulgaris (L.) Fritsch.
Occasional, open disturbed ground.

Scutellaria galericulata L.
Common, marsh.

Scutellaria lateriflora L.
Common, marsh.

* *Stachys tenuifolia* Willd.
Occasional wet meadows and marsh edges.

Teucrium canadense L.
Occasional, wet meadows and marsh edges.

SOLANACEAE

*I *Solanum dulcamara* L.
Common, marsh, swampy woods and open limestone talus.

I *Physalis alkekengi* L.
Rare, disturbed ground below the quarry.

SCROPHULARIACEAE

I *Chaenorrhinum minus* (L.) Lange
Common, disturbed open ground in limestone gravel.

I *Linaria vulgaris* Hill
Common, open disturbed areas.

Melampyrum lineare Desr.
Rare, under pine and oak on west granite outcrop.

Mimulus ringens L.
Common, wet meadows and marsh.

Penstemon hirsutus (L.) Willd.
Occasional, dry open ground, pastures and islands.

* *Scrophularia lanceolata* Pursh
Common, woods and thickets.

I *Verbascum thapsus* L.
Occasional, disturbed open ground.

I *Veronica anagallis-aquatica* L.
Occasional, springs along the western edge of the marsh.

I *Veronica officinalis* L.
Occasional, dry woods.

Veronica peregrina L.
Occasional, dry, open pasture and top of west granite outcrop.

OROBANCHACEAE

Epifagus virginiana (L.) Bart.
Rare, under Beech trees in Northwest Woods and on east limestone outcrop near the quarry.

LENTIBULARIACEAE

Utricularia gibba L.
Rare, edges of marsh pool.

* *Utricularia intermedia* Hayne
Rare, in main *Typha* marsh in middle of southern section.

* *Utricularia minor* L.
Rare, in *Typha* marsh in middle of southern section.
* *Utricularia vulgaris* L.
Common, mostly in the marsh channels.

PHRYMACEAE
Phryma leptostachya L.
Rare, deciduous woods on east side north of quarry.

PLATAGINACEAE
I *Plantago lanceolata* L.
Common, disturbed open ground.
I *Plantago major* L.
Common, disturbed open ground, and on limestone shores on east side.
Plantago rugelii Decne.
Common, disturbed open ground.

RUBIACEAE
* *Cephalanthus occidentalis* L.
Rare, in a spikerush marsh on the west side of the river above Hwy 401 bridge.
Galium aparine L.
Occasional, deciduous woods.
* *Galium tinctorium* L.
Marsh and marsh edges, status uncertain.
* *Galium palustre* L.
Marsh and marsh edges, status uncertain.
Mitchella repens L.
Rare, dry woods under Pine near the Fingers.

CAPRIFOLIACEAE
Diervilla lonicera Mill.
Common dry slopes and outcrops in more or less open locations.
I *Lonicera X bella* Zab.
Rare, disturbed open ground.
Lonicera canadensis Marsh
Rare, deciduous woods north of the quarry.
* *Lonicera dioica* L.
Occasional, Bells island and islands in the marsh and west granite outcrop.
* *Lonicera tatatica* L.
Occasional, disturbed areas.
* *Sambucus canadensis* L.
Occasional, wooded areas.
* *Sambucus pubens* Michx.
Occasional, wooded areas.
Symphoricarpos albus (L.) Blake
Common, dry rocky slopes of west limestone outcrop and the granite outcrops.
Virburnum acerifolium L.
Common, wooded areas.
*I *Viburnum lantana* L.
Rare, Bells Island.

* *Viburnum lentago* L.
Common, islands, woodland edges and thickets.
* *Viburnum rafinesquianum* Schultes
Common, dry open oak woods, islands, promontories and granite outcrop.

VALERIANACEAE
*I *Valeriana officinalis* L.
Spreading after cultivation south of Barkers Point.

DIPSACACEAE
I *Dipsacus sylvestris* Huds.
Rare, pasture at north end.

CUCURBITACEAE
Echinocystis lobata (Michx) T.& G.
Rare, along the shore west of Bells Island.

CAMPANULACEAE
Campanula aparinoides Pursh var. *grandiflora* Holz.
Common, marsh.
I *Campanula rapunculoides* L.
Occasional, wooded slopes on east and west limestone outcrop.
Campanula rotundifolia L.
Rare, limestone boulders near the Fingers.

LOBELIACEAE
* *Lobelia inflata* L.
Occasional, granite outcrops.
Lobelia siphilitica L.
Occasional, woodland edges of marsh.

ASTERACEAE
Achillea millefolium L.
Common, open disturbed ground.
*I *Ambrosia artemesiifolia* L.
Common, open disturbed ground.
Anaphalis margaritacea (L.) Benth. & Hook.
Rare, granite outcrops at north end.
* *Antennaria neglecta* Greene var. *randii* (Fern.) Cronq.
Occasional, dry promontories and shoreline banks.
I *Arctium minus* (Hill) Bernh.
Common, disturbed open ground.
I *Artemesia biennis* Willd.
Rare, along the railway.
*I *Artemesia vulgaris* L.
Rare, meadow on shore north of Bells Island.
Aster cordifolius L.
Common, pastures and drier meadows.
* *Aster ericoides* L.
Rare, meadow along shore north of Bells Island.
Aster lanceolatus Willd.
Common, wet meadows
Aster lateriflorus (L.) Britt.
Common, marsh and marsh edges.

Aster macrophyllus L.
Common, especially in wooded areas of the granite outcrops at the north end.

Aster novae-angliae L.
Common, fields, pastures, edge of railway.

Aster puniceus L.
Common, swampy areas and marsh edges.

Aster umbellatus Mill.
Rare, marsh edge near the Fingers.

* *Bidens beckii* Torr. (*Megalodonta beckii*)
In water 1-2 m deep on the west side of the main channel near the upper marsh channel.

Bidens cernua L.
Common, cattail marsh.

Bidens frondosa L.
Common, cattail marsh.

I *Chrysanthemum leucanthemum* L.
Common, open, often disturbed places.

I *Cichorium intybus* L.
Occasional, open gravelly places.

I *Cirsium arvense* (L.) Scop.
Common, fields, pastures and open places.

I *Cirsium vulgare* (Savi) Tenore
Common, fields, marshes, open places and wet meadows.

Conyza canadensis (L.) Cronq.
Common, disturbed open ground.

* *Erechtites hieracifolia* (L.) Raf.
Rare, disturbed woods on east side near the quarry.

Erigeron annuus (L.) Pers.
Common, disturbed open ground.

Erigeron philadelphicus L.
Common, disturbed open ground.

Erigeron strigosus Muhl.
Common, disturbed open ground and wooded areas.

Eupatorium maculatum L.
Common, marsh.

Eupatorium perfoliatum. L.
Common, marsh.

Eupatorium rugosum Houtt.
Rare, deciduous woods near quarry on east limestone outcrop.

Helianthus divaricatus L.
Rare, on west granite ridge and at south end of west limestone outcrop.

I *Hieracium aurantiacum* L.
Common, disturbed open ground, pastures.

*I *Hieracium florentinum* All.
Common, disturbed open ground.

*I *Inula helenium* L.
Rare, pasture at north end

Lactuca biennis (Moench) Fern.
Occasional, wooded areas.

Lactuca canadensis L.
Occasional, wooded areas.

*I *Lapsana communis* L.
Common, woods along east limestone outcrop.

*I *Onopordum acanthium* L.
Rare, in a stony area around a farm near Barkers Point.

* *Prenanthes alba* L.
Occasional, wooded areas.

Prenanthes altissima L.
Occasional, wooded areas.

Rudbeckia hirta L.
Pare, pasture at north end and along the railway.

* *Solidago caesia* L.
Common, especially abundant in wooded parts of the granite outcrops.

Solidago canadensis L.
Common, marsh edges, pastures and meadows.

Solidago flexicaulis L.
Common, Sugar Maple woodlands.

Solidago gigantea Ait.
Rare, meadow along shore north of Bells Island.

Solidago graminifolia (L.) Salisb.
Common, Bluejoint marsh.

Solidago hispida Muhl.
Common, granite rock outcrops at north end and on dry places on some of the islands in the marsh.

* *Solidago juncea* Ait.
Common, dry crest of islands, granite and limestone outcrops and promontories.

Solidago nemoralis Ait.
Common, drier open locations throughout.

Solidago rugosa Mill.
Occasional, moist wooded areas.

I *Sonchus arvensis* L.
Rare, disturbed open ground along railway.

I *Tanacetum vulgare* L.
Occasional, disturbed open ground.

*I *Taraxacum officinale* Weber
Common, deciduous woods and disturbed open ground and pastures throughout.

*I *Tragopogon dubius* Scop.
Rare, disturbed open ground along railway.

I *Tussilago farfara* L.
Rare, clay bank on east side.

3. PHYTOGEOGRAPHY

Although the Cataraqui Marsh area contains relatively few species that are disjunct or near their distribution limits, it does include species exemplifying 5 interesting phytogeographic patterns.

Perhaps the most interesting element in the regional flora (involving approximately 30 species and many plants that are rare in Ontario) is the southern element which reaches its northern limits (both in Ontario and overall) in the Kingston area (Fox and Soper 1954; Soper, 1955, 1962; Cody, 1982). A good example from the Cataraqui Marsh area is the Chestnut Oak (*Quercus muhlenbergii*). Rare in Ontario, this species has a southern and midwestern total distribution (Fig. 4). In addition there are *Jeffersonia diphylla*, *Teucrium canadense* and *Stachys tenuifolia*. Other predominantly southern species occurring in the Cataraqui Marsh area extend north and reach their distributional limits in the Ottawa valley. Included here are *Asarum canadense*, *Carya ovata*, *Carya cordiformis*, *Dentaria laciniata*, *Hamamelis virginiana*, *Juglans cinerea*, *Juniperus virginiana*, *Najas guadalupensis*, *Heteranthera dubia*, *Staphylea trifoliata* and *Taenidia integerrima*.

Some of the southern species are also western, and a western and midwestern element is present in the Kingston region, and generally in eastern Ontario. Species of this western category in the Cataraqui Marsh area extend east of Kingston but some do not extend far east. Examples include *Rhus aromatica*, *Polygonum douglasii*, and the uncommon aquatic *Alisma gramineum* (Fig. 6).

A number of plants occurring in the Kingston area are characteristic of the Appalachian Mountains region of the United States. One of the most unusual plants in the Cataraqui Marsh area, *Juncus secundus*, provides a good example of this group (Fig. 5). Another is *Crataegus brainerdii*.

Within southern Ontario, the distributions of some plants are strikingly correlated with rock type. Since the Cataraqui Marsh area has both acid granite rock and alkaline calcareous limestone rocks, it is not surprising that it includes plants characteristic of both rock types. Examples of plants confined to granite rocks are *Woodsia ilvensis* and *Corydalis sempervirens*. *Cystopteris bulbifera*, *Corydalis aurea* and *Dryopteris goldiana* are characteristic of limestone rocks.

4. DIVERSITY

Diversity is an important consideration in the protection of natural areas since it not only enhances recreational opportunities connected to natural history but it also relates to protecting the maximum number of components within a given region. Furthermore, floristic diversity is often correlated with faunal diversity.

The Cataraqui area has an unusual diversity of vascular plants in general. It includes 472 native and 153 introduced species for a total of 625. This is undoubtedly a result of both the variety of habitats (woods, meadows, marsh, etc.) and the variety of substrates (acid rock, limestone rock, acid and alkaline soil and water of varying turbidity and chemistry), and the variety of exposures (north, south, etc.).

There are few areas of less than 10.0 km^2 (approx. 4 mi^2) which contain over 600 species. The number of plants in the Cataraqui Marsh area is over 1/3 of the total number of plants found in the central Kingston region (Beschel, 1970), and in terms of native species, it is more than occur in some townships of eastern Ontario.

The diversity of aquatic vascular plants in Cataraqui Marsh was compared with other similar (nutrient-rich, calcareous, alkaline) Great Lakes marshes. In order to achieve the most reliable comparison, difficult groups which may be overlooked or omitted (e.g. *Carex*, *Eleocharis*, *Scirpus*) in some studies, are not included. Despite this, the index includes most true aquatics found in the open water areas of southern Ontario Cattail marshes, and it is believed to be a relatively reliable index of floristic diversity. It is clear from the comparison that Cataraqui Marsh is unusually rich in aquatics. With 51 species recorded (Table 2), it is more diverse than the 5 other Great Lakes marshes for which information is currently available. This is surprising since some of the other marshes are in regions of generally more diverse and unusual vegetation.

This level of aquatic plant diversity is impressive, not only for southern Ontario, but also for a much broader region. For example Forest (1977) had a maximum of 12 species of pondweds in lakes and bays (of similar water chemistry) in New York State.

The marsh vegetation (developing on permanently damp but not permanently inundated substrate) is also diverse, but there is not much data on the composition of southern Ontario Cattail marshes of this type with which to compare it. Although predominantly a Cattail (*Typha* spp.) and Bluejoint (*Calamagrostis canadensis*) marsh, the actual number of plants that occur characteristically (i.e. not accidentally) in these associations in the area is at least 80, so that the marshes are much richer than a first impression would suggest.

5. SIGNIFICANT SPECIES AND COMMUNITIES

The significant species (See "Methods" for determination) found in the Cataraqui Marsh area are shown in Table 3. Three species found in the area have been listed as nationally rare (Argus and White 1977). These are *Jeffersonia diphylla*, *Juncus secundus* and *Quercus muhlenbergii*. These same three as well as *Carex artitecta*, *Crataegus brainerdii*, and *Cinna arundinacea* have been listed as provincially rare. Of the provincially rare and nationally rare species, the most significant is *Juncus secundus* (Fig. 6). The others are less rare in the province and in Canada. An additional 6 species are provincially uncommon and 23 species are locally rare (although some in this latter group may not be as rare as the presently available information suggests). This list (Table 3) of national, provincial and regionally significant species is an impressive one, but it is not remarkable. Several areas of similar size around Kingston and many areas throughout Ontario have more impressive lists of significant vascular plant species (in terms of both the total number and the relative rarity of the species listed).

Most of the significant species present in the area occur there in relatively small numbers (Table 3). This is often the case with rare plants, and it does not necessarily imply that they are dying out. The status of a few of the regionally rare species in the area remains uncertain due to difficulty in field recognition.

Often rare plants are concentrated within an area because they share unusual habitat requirements that are spatially restricted. Within the Cataraqui Marsh study area, such a concentration is not the case. Instead the significant species are widespread with never more than 2 or 3 occurring together. There is a tendency, however, for most of the significant species to be located in the more northerly section where human pressure on the landscape and habitat alteration have been much less. Most of the significant species are plants of wetlands (wet meadow, marsh and open water) and drier exposed portions of rock outcrops and islands.

No significant plant communities have been identified in the Cataraqui Marsh area. The kinds of communities present within the area are also apparently common outside it within the region. The general diversity in the region and the lack of detailed regional information on communities and plant associations make it difficult to know definitely what is significant in terms of being regionally unusual. Although the communities may not be significant with regard to their type, the wetland communities in particular appear to be significant with regard to their diverse composition (see under "Diversity").

6. SIGNIFICANCE OF THE FLORA AND LOCAL FLORISTIC DIVERSITY TO WATERFOWL AND OTHER WILDLIFE

Aquatic vegetation is the primary food of many waterfowl. Areas where certain aquatic plants are abundant represent valuable feeding grounds. It is widely considered important to ensure appropriate feeding areas for waterfowl in order to provide for hunting and for waterfowl viewing. Although less often recognized the latter sometimes represents a significant proportion of total recreational activity (Kreutzwiser, 1981).

Pondweeds (*Potamogeton* spp.) are the food most utilized by ducks in the eastern region of the U.S. and Canada comprising over 12% by volume of the diet (Martin and Uhler, 1939). There are 12 species of pondweeds in Cataraqui Marsn and the species most frequently recognized in duck stomachs, *Potamogeton pectinatus*, is locally abundant. Wild Rice (*Zizania* sp.), Naiads (*Najas flexilis*), Duckweeds (*Lemna* spp.) and Eel-grasses (*Vallisneria americana*) are also very important (Moyle and Hotchkiss, 1945; Martin and Uhler, 1939; McAtee, 1939; Martin et.al., 1961; Lamoureaux, 1970) together comprising over 14% by volume of the diet. All of these species are at least locally abundant in the marsh. In Addition water plantains (*Alisma* spp.), Arrowheads (*Sagittaria* spp.) and Bur-reed (*Sparganium* spp.) are important food sources and are all abundant in the marsh. Bur-reed seeds in particular are reported to be a favourite food of the Mallard Duck with 1,082 of the 5 mm long seeds being taken from a single stomach (McAtee, 1939).

The variety of aquatic plant foods available in the Cataraqui Marsh area (see Table 2) is advantageous since different species become available at different times so that the period of waterfowl utilization is increased. Taking into account both the abundance and diversity of waterfowl food plants in the marsh, and the size of the marsh, Cataraqui has an unusually high potential as a waterfowl feeding area.

Studies have shown that increased structural variation and diversity (expressed in terms of number of different plant communities) is correlated with increased use by wildlife (e.g. Weller, 1978). The general diversity of habitats in the Cataraqui area is impressive. However, the main marsh has been referred to as "a dense overmature stand of cattail, mostly floating, with minimal openings or diversity" (Hodges and Arbour, 1981). Quite to the contrary, the main marsh is rich in species and diverse in plant assoiciations (see under "Vegetation"). The notion that extensive cattail marshes are of limited value for wildlife is based on both the perceived increase in duck production associated with water-edge habitats and the general lack of understanding of the complexity and variation in cattail marshes. Of course wildlife is not restricted to ducks. Rails, Marsh Wren, Bitterns, Blackbirds, and many other animals, and various significant plants may be disadvantaged by open water edges, and prefer marsh interiors.

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Table 1. Summary of Vegetation Types

A. Wooded areas
    1. Red Oak dominated
    2. Sugar Maple dominated
    3. Eastern Hemlock, Eastern White Pine
    4. White Cedar
    5. Disturbed second growth woods with some Manitoba Maple
    6. Pine Plantation

B. Thickets
    1. Speckled Alder sometimes with Winterberry and Chokeberry
    2. Hawthorns, sometimes with Dogwoods and Nannyberry

C. Open herbaceous vegetation on dry and mesic sites
    1. Pasture and meadow
    2. Open disturbed ground (edges of roads, railway, quarries, etc.)
    3. Open granite bald

D. Marsh Vegetation
    1. Sedge and graminoid marsh
        1. Wet meadow-Bluejoint-sedges
        2. Sedge Marsh
        3. Spike-rush marsh
        4. Deep Sedge marsh
    2. Cattail Marsh

E. Aquatic Vegetation

Table 2. Numbers of species in various groups of aquatics in 6 Great Lakes Marshes in southern Ontario

	Catarequi Marsh[1]	Pelee Marsh[2]	St. Clair Marsh[3]	Coctes Paradise Marsh[4]	Rouge River Marsh[5]	Oshawa Second Marsh[6]
1. Cattails (*Typha* spp.)	3	1	3	3	2	2
2. Bur-reeds (*Sparganium* spp.)	2	2	1	3	2	1
3. Pondweeds(*Potamogeton* spp.)	12	12	7	8	5	2
4. Naiads (*Najas* spp.)	2	3	1	1	1	0
5. Horned Pondweed (*Z. palustris*)	1	0	0	1	1	0
6. Water-plantains (*Alisma* spp.)	2	1	1	1	1	1
7. Arrowheads (*Sagittaria* spp.)	3	1	3	2	2	2
8. Frog's bit family (Hydrocharitaceae)	3	3	2	2	2	1
9. Wild Rice (*Zizania*)	1	1	1	1	0	0
10. Pickerel-weed family (Pontederiaceae)	2	2	2	0	0	0
11. Lizard's Tail (*Saururus cernuus*)	0	1	0	0	0	0
12. Duckweeds (Lemnaceae)	5	5	4	5	5	2
13. Arums (Araceae)	1	0	2	1	0	1
14. Coontail (*Ceratophyllum demersum*)	1	1	1	1	1	1
15. Water-lilies (Nymphaeaceae)	2	4	4	3	2	2
16. Aquatic Buttercups (Ranunculaceae)	1	0	1	1	1	1
17. Watercress (*Nasturtium officinale*)	1	0	0	1	0	1
18. Marsh Cinquefoil (*P. palustris*)	1	1	0	1	1	0
19. Water-milfoils (*Myriophyllum* spp.)	2	2	3	1	2	0
20. Aquatic Speedwells (*Veronica* spp.)	1	0	0	?	1	2
21. Bladderworts (*Utricularia* spp.)	4	1	0	0	0	0
22. Water Willow (*Justicia americana*)	0	1	0	0	0	0
23. Water Marigold (*Bidens beckii*)	1	1	0	0	0	0
Totals	51	46	38	39	29	19

1. Catling, present study 1983
2. Haycock, Reznicek and Gregory 1978
3. Gow, Kelly and McLean, 1982
4. Pringle, 1969
5. Riley, 1978
   Riley, Varga and Oldham, 1981
6. Cecile, 1981

Table 3. Significant species in the Cataraqui Marsh study area, with habitat and status information, and UTM reference. Taxa considered rare in Canada are preceded by a "C", those rare in Ontario by an "O", those uncommon in Ontario by a "U", those rare in the central Kingston region by an "R".

U *Alisma gramineum* L.
About 50 plants at three points along east shore in shallow water over limestone pavement (834023, 828012, 829013).

R *Amphicarpa bracteata* (L.) Fern. var. *comosa* (L.) Fern.
Edges of Typha marsh. Status in the area uncertain (844043).

R *Anemone quinquefolia* L.
Under Red Oak on islands in the marsh. Approximately 200 plants (845040, 848037).

R *Aster ericoides* L.
Several clumps in open meadow with *Agropyron repens*, *Agrostis stolonifera* on east shore above Bells Island (818008).

U *Bidens beckii* Torr.
In water 1-2 m deep with *Myriophyllum exalbescens*. At last 110 plants seen (836034, 837034).

U,R *Carex amphibola* Steudel var. *turgida* Fern.
Distrubed deciduous woods (831007).

O *Carex artitecta* Mack. (*C. nigromarginata* var. *muhlenbergii*).
In dry more or less open oak woods with *Danthonia spicata*. Approximately 30 plants seen (845040, 846039).

R *Carex brevior* (Dewey) Mack.
In wet meadow with *Carex stricta*. At least 10 clumps seen, possibly more common in the study area (848043).

R *Carex prairea* Dewey
In wet meadow, status uncertain in the study area due to confusion in the field with *C. diandra* (848043).

O *Cinna arundinacea* L.
Moist Red Ash stand. Three clumps (850039).

O *Crataegus brainerdii* Sarg.
At least two plants along the railway south of hwy. 401.

R *Cyperus rivularis* Kunth
Sandy beach. Four plants (827005).

R *Dentaria X maxima* Nutt.
With *Erythronium americanum* in Sugar Maple Woods (838029).

U *Dryopteris goldiana* (Hook.) Gray
with *Dryopteris marginalis* and *Impatiens pallida* on wooded limestone talus. About 50 plants along 100 m of talus (851039).

R *Epilobium glandulosum* Lehm.
With *Calamagrostis canadensis* in the marsh. Status in the study area uncertain (845040).

R *Hierochloe odorata* (L.) Beauv.
Open bank of railway. Only one small patch (825034).

R *Impatiens pallida* Nutt.
Wooded limestone talus. Several hundred plants along 175 m of talus scope (851039).

C,O *Jeffersonia diphylla* (L.) Pers.
Limestone talus slope under Sugar Maples. Approximately 25 plants (825034, 823031).

C,O,R *Juncus secundus* Beauv.
Open granite ridge top with *Polytrichum* mosses and *Deschampsia flexuosa*. Five small clumps (844046).

U,R *Juncus vaseyi* Engelm.
Open granite ridge top with *Polytrichum* mosses. Three clumps (844046).

R *Leersia virginica* Willd.
Low area in young Sugar Maple Woods. One patch about 3 m square (836024).

U,R *Najas guadalupensis* (Spreng.) Magnus
With *Vallisneria americana* in water 1.5-2 m deep in the upper Cataraqui River (844044, 839035).

C,O,R, *Quercus muhlenbergii* Engelm.
Four mature trees in open Red Oak woods on east limestone outcrop south of hwy. 401 (824033).

U,R *Utricularia gibba* L.
In muddy substrate on edge of *Typha* marsh. Ten plants seen, possibly more common in the study area (828030).

R *Utricularia minor* L.
In *Typha* marsh. Approximately 40 plants seen (825025, 826024).

R *Zannichellia palustris* L.
Washed ashore, precise origin uncertain (826005).

R *Solidago hispida* Muhl.
Open woods on west granite ridge. Thirty-three flowering plants seen (847048).

Figure 1. Major features of the study area.

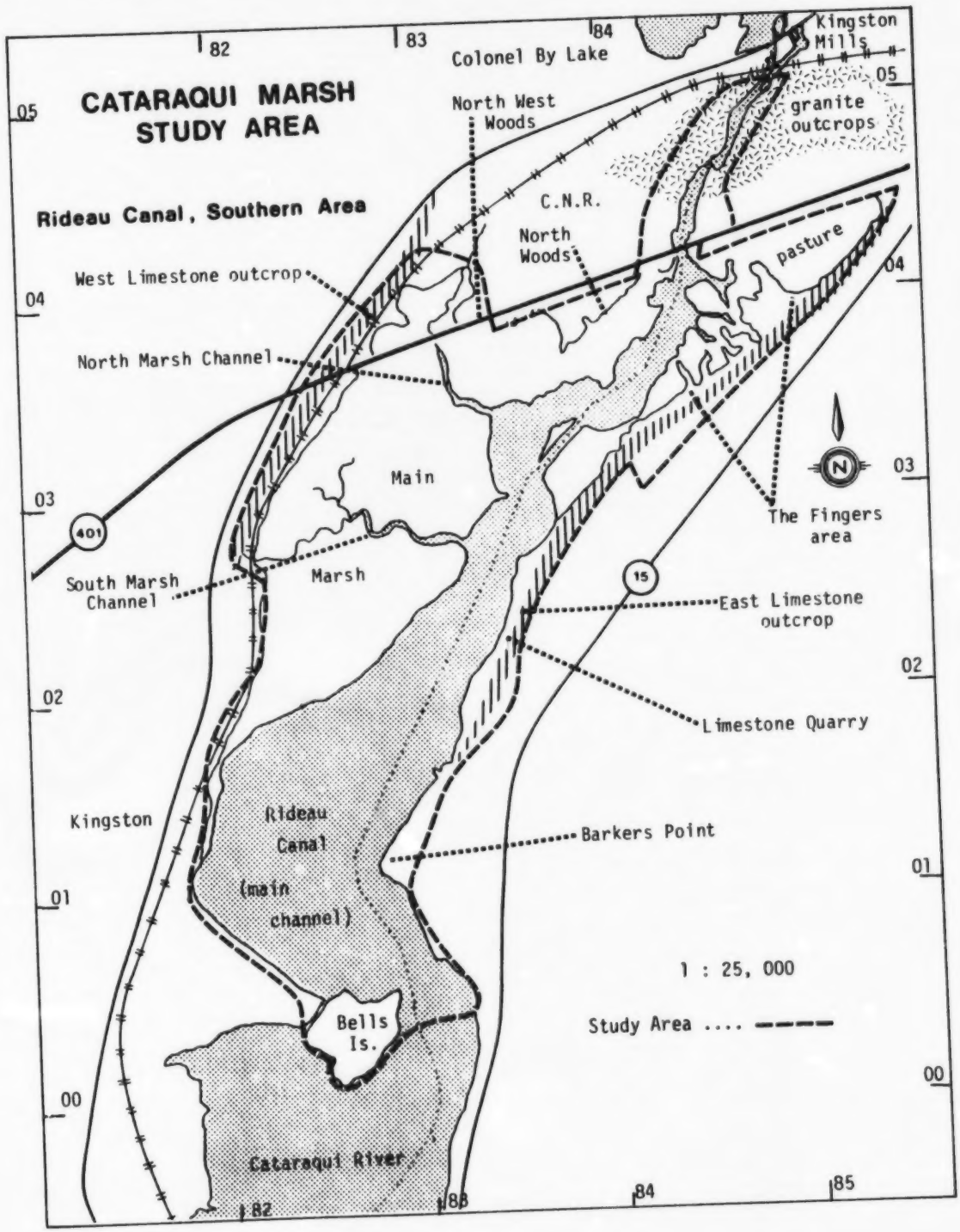


Figure 2. Aerial photograph of the study area.

Figure 3. Locations of wooded areas (A).

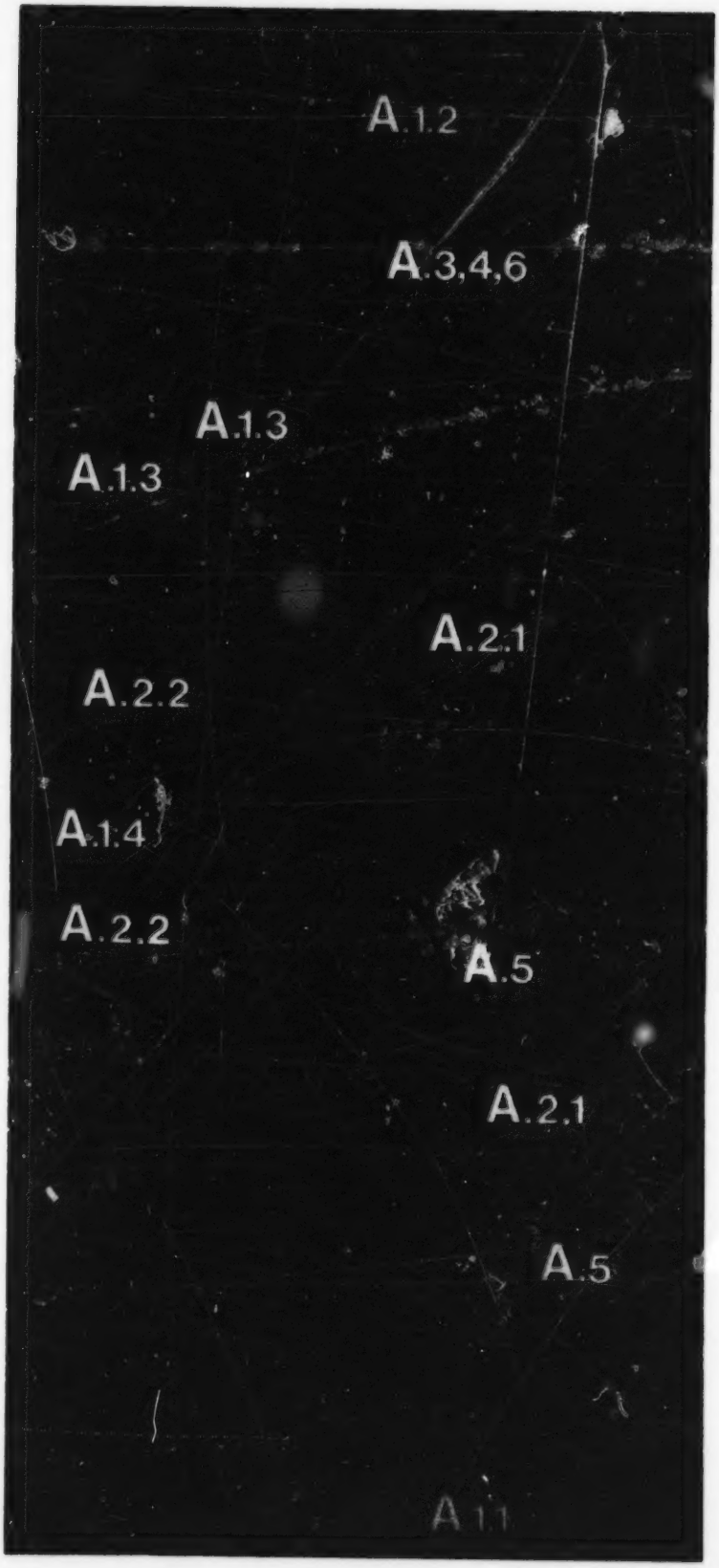


Figure 4. Location of islands and promontories.

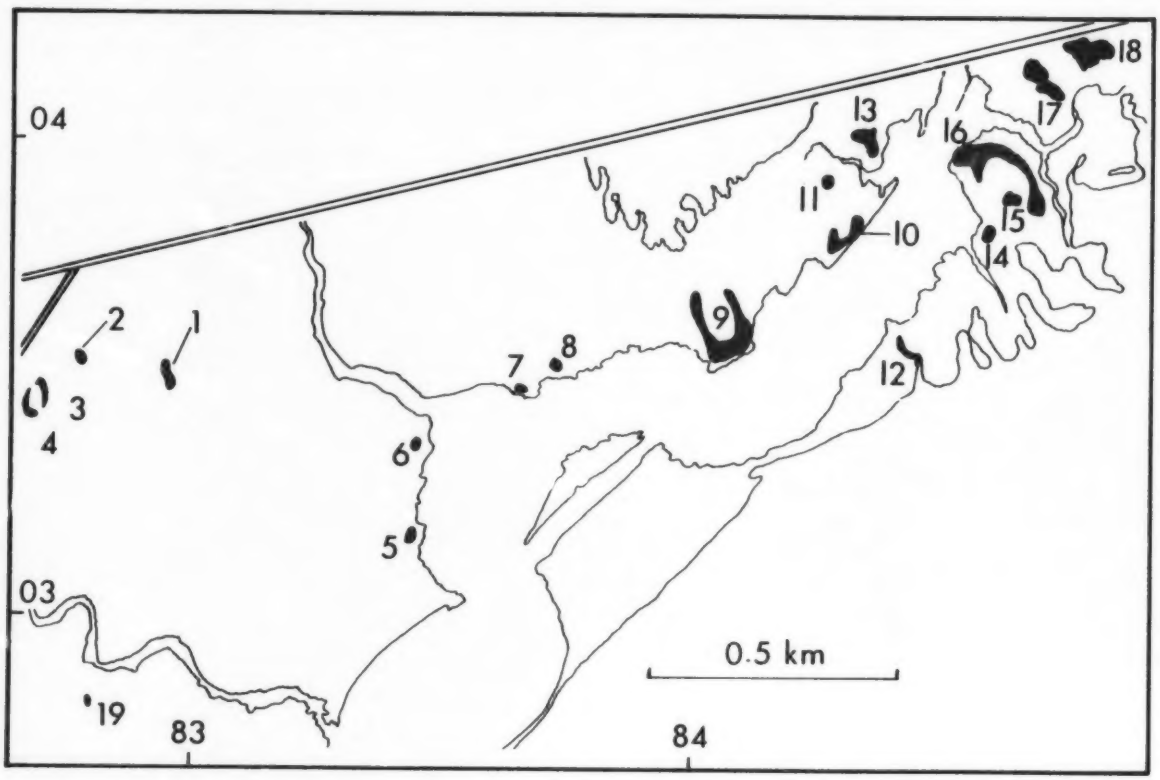


Figure 5. Locations of major areas of thickets (B) and open herbaceous vegetation on dry and mesic sites (C).

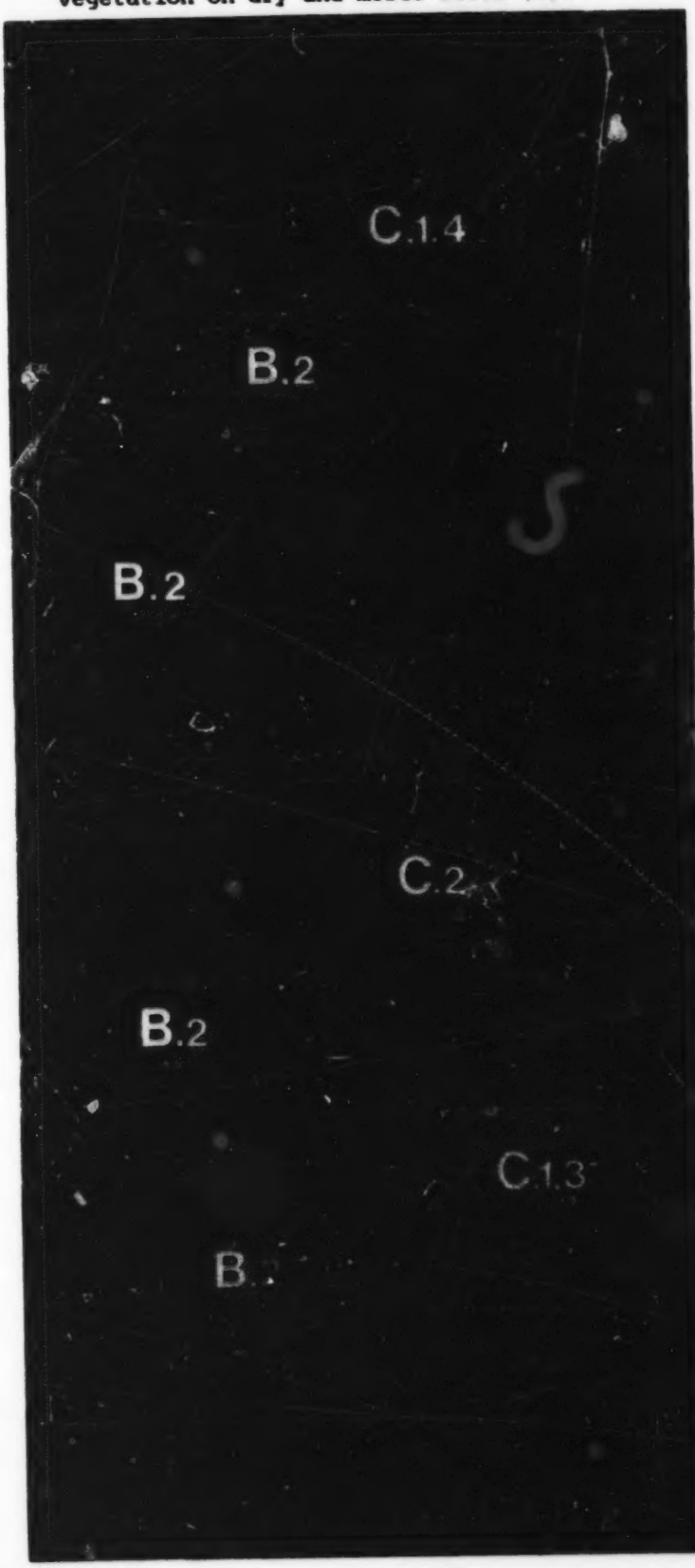
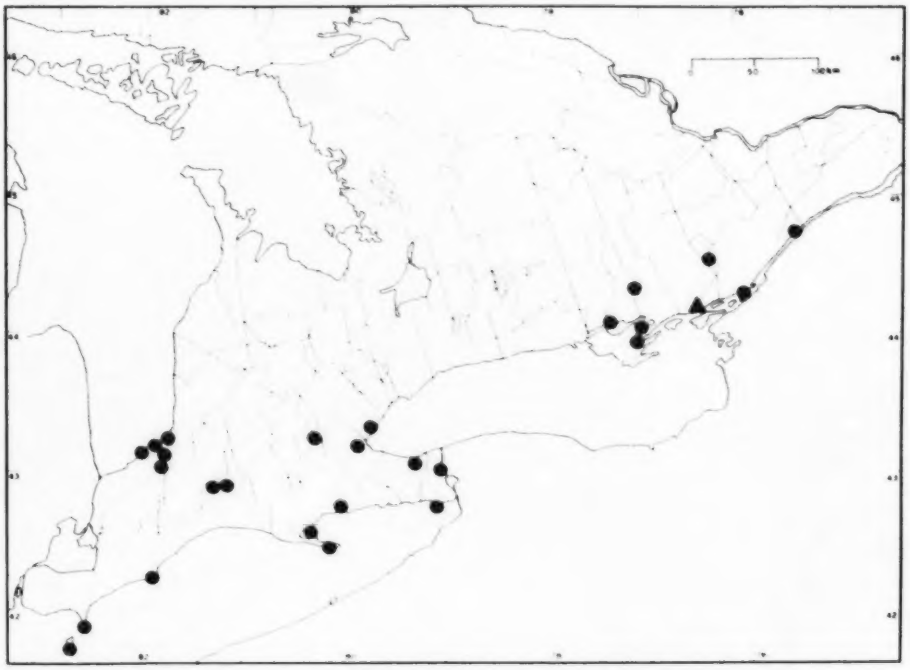


Figure 6. Locations of marsh vegetation (D).

Figure 7. Distribution of *Quercus muhlenbergii* (Chestnut Oak) in Ontario (above) and North America (below). The Cataraqui Marsh area is shown with a triangle. The upper map is based on herbarium specimens (dots). The lower outline map is based on Fox and Soper (1954) and Little (1971).



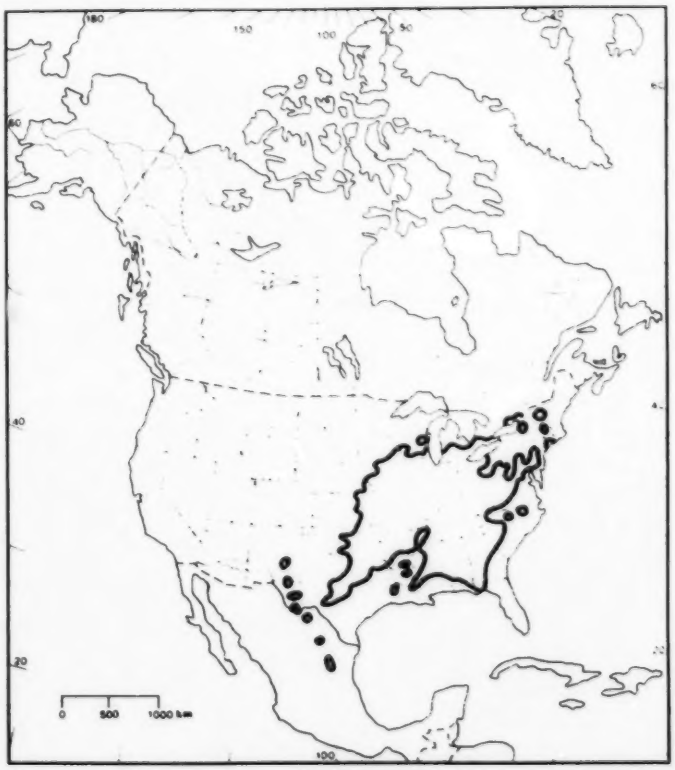
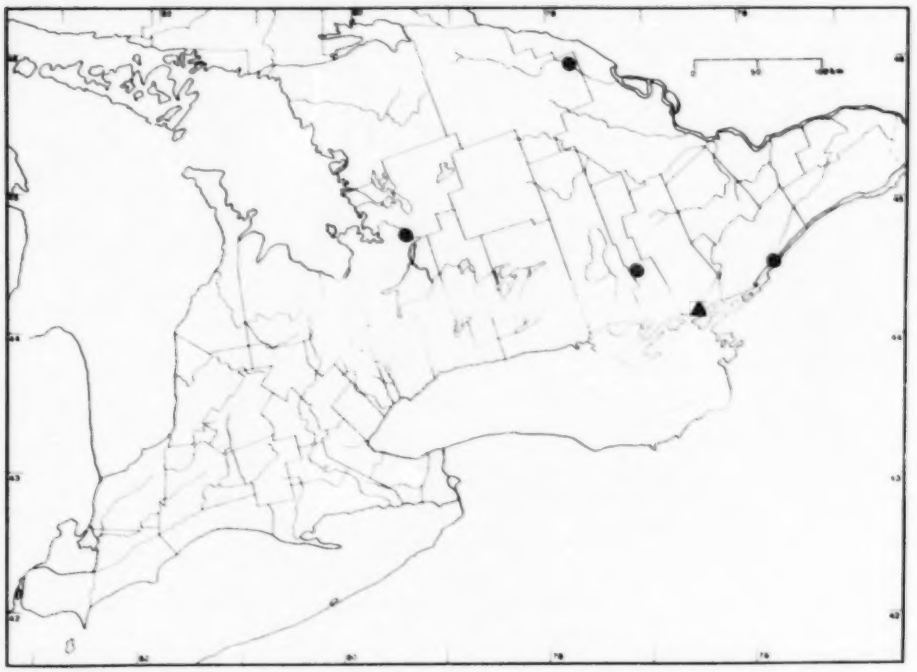


Figure 8. Distribution of *Juncus secundus* (One-side Rush) in Ontario (above) and North America (below). The Cataraqui Marsh area is shown with a triangle. The upper map is based on herbarium specimens (dots). The lower outline map is based on information gathered for the 4th edition of the atlas of the rare vascular plants of Ontario.



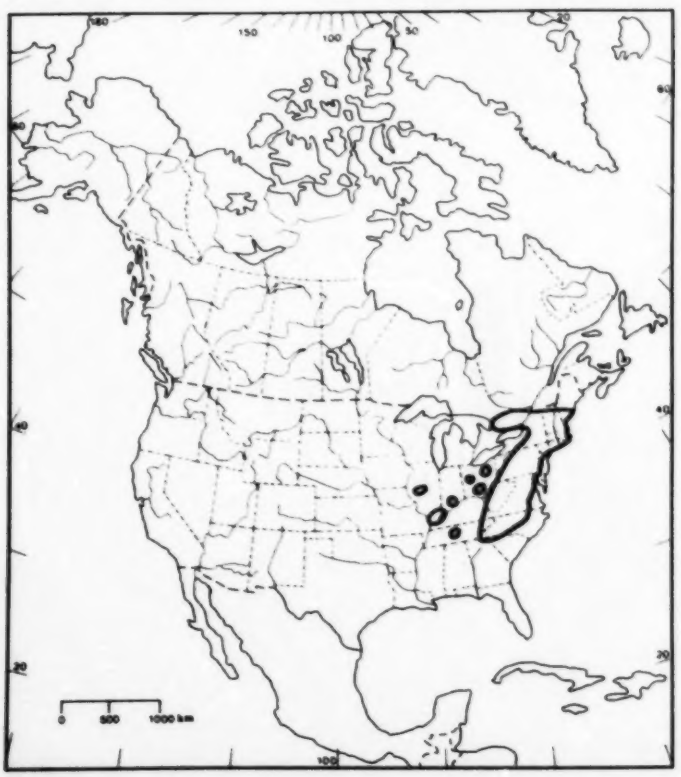


Figure 9. Distribution of *Alisma gramineum* (Grass-leaved Water-plantain) in Ontario (above) and North America (below). The Cataraqui Marsh area is shown with a triangle. Both maps are based on herbarium specimens.